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PACIFIC RAILWAY,

AND

Texas Western Railroad Charter.

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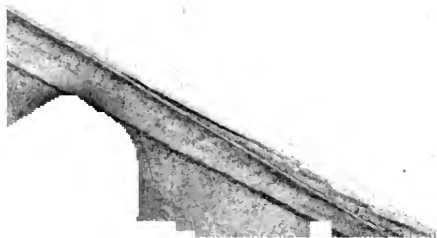
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PACIFIC RAILWAY,
AND
Texas Western Railroad Charter.



TEXAS WESTERN RAILROAD.

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SURVEY OF ROUTE,

ITS COST AND PROBABLE REVENUE,

IN CONNECTION WITH THE

PACIFIC RAILWAY;

Nature of Country, Climate, Mineral and Agricultural Resources, &c.

A. B. Gray

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CINCINNATI, OHIO:

PORTER, THRALL & CHAPMAN, PRINTERS.

1855.



NOTE.

This pamphlet contains the Report of A. B. GRAY, Esquire, upon the practicability and advantages of a Pacific Railroad route through the State of Texas to California; from Surveys and Explorations made by him along the Parallel of 32 degrees, North latitude. Also, estimate for cost of constructing and equipping, maintaining and operating a first class road; its probable earnings, and revenue to be derived from donation of lands under the Charter granted the "Texas Western Railroad Company," of which a copy is appended. The Maps, Profiles, Sketches of Mountain Passes, and Landscape Views, are to be found at the Company's office, New-York city.

SAMUEL A. SARGENT,

Agent.



REPORT OF A. B. GARDNER,
UPON THE
ATLANTIC AND PACIFIC RAILWAY.

NEW YORK, February, 1855.

*The Honorable President and Directors of the
Texas Western Railroad Company:*

GENTLEMEN:

The computations and estimates given in the rough statement last November, having been carefully revised, I have now to submit to you the following, as the results of my reconnoissance in the vicinity of the parallel of 32 degrees north latitude; for the purpose of determining the practicability of constructing a railway to connect the Atlantic and Pacific oceans.

The maps, profiles, landscape views, and sketches of mountain passes, exhibiting the nature of the country, with its topographical features, will aid in illustrating the feasibility as well as practical advantages of the route through the state of Texas.

Early in December '53 I reached San Antonio, via New Orleans and Indianola. At the latter place I received a dispatch from one of the commissioners of the company, requesting me to repair to the capital (Austin), upon matters connected with his mission. Returning to San Antonio, I organized a party, consisting of nineteen persons well armed and equipped;

having previously provided myself with the necessary instruments for survey; and on the 1st of January, 1854, set out for Fort Chadbourne, where we arrived the 13th of the same month. Our route was that usually traced northward by way of Fredericksburg and Fort Mason, crossing the rivers Guadalupe, Piedrallís, Llano, San Saba, Concho, and the west fork of the Colorado. The observations from the *Gulf coast* at Matogarda Bay, fully prove it to be practicable, should a branch railway at any time be deemed expedient to connect with the proposed main stem on the parallel of 32 degrees, north latitude.

Fort Chadbourne, near the present northern frontier of Texas, was established about three years ago, upon Oak creek, a tributary of the Colorado. I found it to be in latitude 32 deg. 01 min. 40 sec.; and longitude very nearly 100 deg. 05 min. west from Greenwich. It is relatively situated to the navigable waters of the Mississippi near Shrevesport, 407 miles south of west; and from El Paso on the Rio Grande, it is 376 miles east. From St. Louis, Mo., it is about southwest, distant 700 miles. Examinations had been made from the eastern boundary of the State thus far, by Hon. Thos. J. Rusk, U. S. Senator, and General Orville Clarke, of New York; whose reports being highly favorable to the construction of a railway, and having upon several expeditions explored much of that district of country myself, it was deemed advisable that I should proceed at once to make this my point of departure, west on the line of 32. Reference to the nature of the country up to this place, and its peculiar adaptation to a railway, will be made in the following Chapter.

Fort Chadbourne to the Mustang Springs.

This section comprises a distance of 100 miles in an almost direct line west; the springs being in latitude 32 deg. 04½ min. north.

On the 17th of January we took our departure from Fort Chadbourne, and following Oak Creek seven miles, after a gradual ascent, emerged upon a plain stretching off to the north and west, with visible elevations and mountain peaks in the distance. Twenty miles upon this plain brought us to the summit of a divide, by a rise of 27 7-10ths feet per mile, whence we descended 12 miles further by *by ten feet less grade* to the Colorado River, which was forded at a point having no appearance of overflow of its banks; thence ascended a small tributary for 30 miles at 10½ feet per mile.

From the head of this valley we passed over slightly elevated spurs, putting out from the edge of the Llano Estacado, separating the "Big Springs" of the Colorado, from those called "Mustang Springs." There was no necessity for this, as we shortly after discovered; still, without guides other than my instruments, our safest course appeared to be the one followed, to reach water. A course, little south of west from the head of the valley, would have given a gentle ascent of 8 feet per mile, and descent not exceeding 10 feet per mile for 25 miles: likewise have been more direct, and avoided the rough gullies and hills encountered by us.

Sunday, the 22d of January, we struck the emigrant trail, (leading from Fort Smith, Arkansas, to El Paso), having traveled due west six miles from our night's encampment, and following the road S.

45 deg. W., at 10 o'clock, A. M., halted to take observations of the sun. Equal attitudes for time, and circum-meridian altitudes for latitude, gave us our position 32 deg. 05 min. 26 sec. north. This determination I confidently relied on, my instruments being in good adjustment, and the atmosphere clear.

In less than one hour's march (say two and a half miles), from the noon station, to our surprise, we made the *Mustang Springs*, 18 miles from their represented position upon the map in our possession.

These Springs were found to be a series of small ponds or lakes, of a sulphurous and bitter taste, like most of the water emanating from the gypsum formation of the Llano Estacado. They are about a mile in extent, and not observable until within a few hundred yards, being in a depression of the plain sixty feet below the surface. Wild geese and ducks were abundant, and a mess for all hands obtained. The name is derived from their being the resort of *Mustangs* for water; or probably because it is a general camping place for the Camanches and other Indians, in their predatory excursions to the Rio Graned; and where the fattest of these animals are selected for feast occasions. These feasts must have been frequent, as it is a perfect golgotha of horses skulls and bones.

It will be seen that the heaviest grade in this section does not exceed 27 feet and 73 hundredths per mile, while most of the way it is so light, as to be almost level. One stream of 40 feet, to cross, having firm banks, and the ground by nature in many parts already prepared; with little or no masonry required. There will be very light cutting and filling, and no expensive blasting or rock excavation, being chiefly soft sand-

stone and lime. The curves are few, and all of great radii.

For pastoral and agricultural purposes this section of country is believed by those who have been through it, to have no superior. Springs and streams of fine water everywhere abound, the quality of the soil being very excellent; whilst lime and sand-stone quarries are abundant. Though just after a heavy norther in January, the bright buffalo and mezquit grasses waving in the sunlight and glistening from every valley and hillslope, presented the appearance of vast cultivated fields; whilst the picturesque oak groves resembling orchards, and the gardens of the settlers about Fort Cladbourne, furnished indisputable evidence of productivity and a genial climate.

Two companies of dragoons were stationed there, under command of Lieut. Hawes. Large supplies of excellent hay, the spontaneous growth of the neighborhood, were piled up near the stables, and everything seemed to contribute towards an early, prosperous and thick settlement. It presents one of the most attractive and well-favored districts, although so recently having the appearance of a savage wilderness.

From the almost entire absence of snow and severe cold, it seems to be well adapted to the raising of cotton, tobacco, corn and wheat, as well as the esculents and grains generally.

Some idea of the salubrity of the climate may be found in the following memoranda, computed from an interesting meteorological journal of assistant surgeon Ephraim Swift, U. S. Army; to whom, and many other officers, I am greatly indebted for facilitating the object of the expedition, and for other kindnesses to which I shall refer more particularly hereafter.

Mean temperature of Fahrenheit's Thermometer years 1852 and 1853, Fort Cladbourne, Texas.

PARALLEL OF 32.

WINTER MONTHS.		SUMMER MONTHS.	
1852.	November, 51° 7	1853, June,	70° 59
"	December, 48° 74	" July,	74° 71
1853.	January, 48° 5	" August,	75° 58
"	February, 51° 3	" Sept.	70° 59
"	March, 53° 48		

Greatest heat at 3 P. M., 96°, twice in August.

Greatest cold sunrise, 7 o'clock, February 7th, 9° above zero once.*

Four inches of snow—disappeared in 12 hours.

Greatest depth of rain 6.48 inches—month of May.

What is here remarked of the country, its productiveness and climate, will apply to an extent of 500 miles, from the eastern borders of the state of Texas along the 32d degree of north latitude. I am not wrong in asserting that esculents of every kind and almost every want which can be relieved from a rich soil and salubrious clime, will be supplied throughout this distance—and in a very short period of time. I was for more than a year engaged in marking a portion of the eastern boundary of Texas, and having assisted in establishing on the ground the parallel of the 32nd degree of north latitude, where it intersects the Sabine, the Brazos, and the Colorado rivers, and on expeditions at various seasons through the adjacent districts, I can say, that I know of no country more peculiarly adapted in every way to the construction and maintenance of a railroad. The mild and spring-like atmosphere, a perpetual healthy and pure climate, suitable to the growth of the most valuable staples;

*This was during a "norther," which lasted less than a day.

its numberless rivulets and fine alluvial bottoms, fruitful vallies, and rich uplands interspersed with prairie and timber; a far greater proportion of cultivable ground; inexhaustible beds of excellent coal, iron, and other mineral deposits, render it in varied and valuable resources unequaled for such a length of line as this railway will embrace. The western end of this section towards the Mustang Springs, though of equally fertile soil, and covered with exuberant grasses, is chiefly devoid of timber, only occasional groups of dwarf mezquit and hackberry.

These conclusions are not dissimilar to those of others who have had opportunities of observing the nature and climate of this region. Major Hamilton W. Merrill, 2nd U. S. Dragoons, for some time commandant of Fort Belknap, on the Brazos River, an officer distinguished for his keen perceptive and observing faculties, in a communication to the Hon. Anson Jones, of Texas, under date of May, 1854, says :

“An active service of over five years in your state, most of which has been confined to the remote borders, has brought under my personal observation much of her country, and, I may say, all you refer to, and as lying east of the Rio Grande. For grazing purposes there is, perhaps not a finer country in the world. The climate of this latitude is mild and beautiful all seasons of the year. For general health, it will compare with an equal extent of any country throughout the United States. Nearly all the country along this route is susceptible of a dense population, composed generally of rich lands easily cultivated, well watered, and has an abundance of stone, with a due proportion of timber.

“That the line of 32 degrees is by far the cheapest and most practicable route for the Atlantic and Pacific Railroad, is, in my own mind, settled beyond a doubt. Possessing an easy grade, with ample stone, timber, and water, passing through a rich and beautiful country, with a climate not surpassed, if equalled, by any in the world, it cannot fail to attract the attention of all, and become the favorite route of the country.”

From Mustang Springs to the Pecos river—115 miles.

This line comprises the transit over the Llano Estacado, the first *Steppe* east of the Rocky Mountains. It deviates very little from a right line west and southwest, avoiding a narrow ridge of sand hills which extend for fifty miles to the south east, besides being over a slightly undulating, and otherwise favorable portion of the Plain.

The Llano Estacado, or Staked Plain, is an elevated, and almost uninterrupted table, extending 300 miles south from the parallel of 35 deg. 11 min. north latitude, with an extreme breadth, near its middle, of 180 miles. It is bounded entirely on the west by the Rio Pecos, and from the eastern and south-eastern edges issue innumerable springs and rivulets. It is the fountain-head of the Red River of the Mississippi; the Brazos, the Concho, and the Colorado of Texas. The northern-most part is represented to be 4,000 feet above the level of the sea, but the highest elevation observed by me in crossing it was 2,995 feet. This shows a gradual slope towards the parallel of 32 deg.

Under the government of Old Spain, a trail over it from N. W. to S. E. connected the military posts and missions of New Mexico, with those of San Saba and San Antonio in Texas. Long stretches, slightly undulating, without land-marks, caused the Mexicans to plant stakes for the purpose of indicating the approaches to water, and thus originated the name of Llano Estacado or "Staked Plain."

It is by no means a desert or barren waste, for with exceptions of narrow belts less prepossessing, there are vast fields of fine grazing lands, where antelope, deer, and other game are seldom out of sight. It is

true that no timber is seen, except here and there a stunted mezquit, and no streams flow over it; but in the deflection made by us we found at the sand hills inexhaustable quantities of the purest water, and from personal observation, I am satisfied that it may be had any where not far below the surface. Rich and exhuberant grasses cover most of the way, but where the soil is sandy, it is coarse and less nutritious. The arid portions being limited, offer no impediment to the construction or travel of any kind of road; but its gently undulating surface, unbroken and free from chasms, or rocky cliffs to cut through, present great advantages.

Much of the soil is good, and I question if the grass set on fire annually by the Indians, on their return from merauding expeditions into Mexico, together with the "northers," which sweep with such violence over this plain, are not to a great degree causes of the total absence of timber. In burning the grass behind them, the object of the Indians is to accelerate the spring growth, and prevent immediate pursuers having grass for their animals. A war party had, a few days previously, passed along, and for many miles the fire was raging around us. As far as the eye could witness, all was a-blaze, and at night appeared like a vast amphiheater of illuminated cities. This is not one of the least beauties of the prairies. It was not unfrequent to find large isolated patches, untouched through changes of the wind, upon which we encamped, suffering but little inconvenience, in the want of forage for our animals. A narrow space previously burned off, or an ordinary road, will often stop the progress of the flames. The prairie fires are not,

therefore, of any consequence, as far as injury they might be supposed to do a railway.

It suddenly turned cold the evening we reached Mustang Springs, and blew a severe norther, making it exceedingly unpleasant. When these peculiar gales are encountered on the plains without shelter from timber or hills, they are often destructive to animals. They are not frequent, however, and seldom last over a day in this region. Parties with heavy cargoes on their mules, encamping after a hard day's march, have been caught in the night, and many of the fatigued and stiffened animals perished before morning. January, in this latitude, is the month of northers, ourselves experiencing three in succession; but I took the precaution, when overtaken by them without cover, to travel, whether night or day. Facing their keen blast for 17 miles at a time, was severe on the men, with their long beards encased in ice, from the moisture of their breath; but I was aware that their safety depended upon it, and thus prevented extreme suffering and the loss of a single animal. This was the first time we knew the Staked Plain attempted to be crossed by a party in the depth of winter; and without trails or guides, it was necessary that great caution should be observed. Notwithstanding these cold storms, the grama and mezquit grasses grow luxuriantly, remaining good and nutritious the entire year.

The error of locality in the Mustang Springs, caused much speculation around the men's camp-fires. They were pleased with the idea of being so much further on their way than expected;—but *my* confidence in the map was lost, and all hands were caution-

ed to be well prepared before starting again. Having an extended view of the surrounding plain, and enabled to observe the character of country for great distances, I determined to proceed to the Sand Hills, certain of finding water there; and from thence make examinations to the Pecos River, being but a slight deviation from the desired line. After 7 hours' rest, at one o'clock, A. M. 23d of January, the camp was aroused, canteens and ten gallon keg filled, and our journey resumed. The barometer had fallen since the cold storm, but at noon next day, the sun came out bright, and I obtained some good observations for latitude. On the second evening, at ten o'clock, we reached the springs in the Sand Hills; which, instead of 50 miles travel, proved to be 63½. This was a sad drawback to some of my men, who had not been provident with their rations of water; and the last seven miles' march was a weary and severe drag. At sight of the springs there was no ceremony between men and mules, but each appeared to vie with the other, in seeing which could drink the most. These singular-looking hills seem to be an accumulation of fine white sand, heaved together near the lower part of the plain; extending south-eastwardly for the distance of full fifty or sixty miles from the parallel of 32, with an extreme breadth of ten miles; and innumerable hillocks and ridges 40 to 80 feet high, that at night resemble waves of the sea. Though fatigued by a long march, there was something exceedingly interesting in our passage through them; the alternating light and shade, occasioned by clouds passing before the moon, the gleaming of the water, and the uniform ripples in the sand, adding to the general beauty, exciting much wonder and admiration.

We experienced no extraordinary difficulty with our train, including pack animals and wagon; though the last three miles, were the most troublesome from the great depth of the sand; but every few hundred yards we found abundance of water. I can well understand, however, the terrible consequences to a party attempting the passage of these hills a hot day of summer. It would be attended with almost certain disaster to a train. A road over the plain from the Mustang Springs west for 115 miles, even without water, would be far better after it is beaten down. I feel confident, however, that subterranean streams exist throughout the Llano Estacado, and water will be had by sinking wells anywhere on this line. If that should fail to be the case, then depressions with sufficient drainage exist, where reservoirs can be made at little expense, to hold any quantity collected in the rainy season; such as nature seems to point out in the dry section, near the head of the Gulf of California where we found vast natural tanks, containing thousands of gallons. In the Sand Hills we encamped a day, for the purpose of exploring and taking observations for latitude and time, when, I dispatched the greater number of the party with the ambulance and baggage by the trail, to Marcy's crossing; while five men and myself made due west, striking the Pecos river in 43 miles, over a level and firm portion of the Llano Estacado.

To the summit of the plain from the Mustang Springs, there will be an ascending grade of 15 6-10 feet per mile for 71 miles, and thence to the river bank descending grade of 13 4-10 feet to the mile, for 44 miles; with no bridging or masonry, no curves of

any consideration, and the slight excavation and embankment required, will be mostly in soft sandstone, or a lime and gypsum formation. Cross-ties will have to be brought from the Guadalupe mountains, 100 miles west of the Rio Pecos, if they cannot be floated down that stream, or else from the neighborhood of Fort Chadbourne. The road itself when completed to this place, may, as it progresses, with little extra trouble and expense, be made the means of easy transportation for all the materials necessary for superstructure.

From the Pecos river to El Paso, on the Rio Grande—
161 miles.

The latitude of the proposed crossing of the Pecos is 31 deg. 45 min. This river, though tortuous in places, may possibly be made a channel to convey rafts of timber for railroad purposes, if needed. It heads far north, in the neighborhood of Santa Fe, New Mexico, and where the parallel of 31 deg. 45 min. intersects it, is a bold, running stream, sixty-five feet wide, pursuing a S. E. course until it joins the Rio Grande, 400 miles below El Paso. Its valley is from one to three miles in width, and might be made highly productive, having a rich and fertile soil. There is no timber about it near the line of the proposed route, except for firewood. Above the 32nd parallel, there are numerous rapids over a rocky bottom. It has firm banks, and can be easily bridged. We forded it with the cargoes on the mules, without difficulty.

Between the Pecos river and the Rio Grande are two lines proposed, differing but little from each other in length. That examined instrumentally by me (the

Guadalupe Peak Route), was found to be perfectly practicable, yet believed to have less advantages than the other.

By the Guadalupe Peak, Sierra los Cornudos, and Sierra Alta, or Hueco Mountains, there are several steep grades, with one or two short distances of deep cutting and filling; but by lengthening the road some three or four miles, and descending more gradually along the western slope of the Sierra Guadalupe, toward the Ojo del Cuervo (Crow spring, as it is sometimes called), less cutting would be encountered.

The altitude at the crossing of the Pecos, is 2,497 feet above the sea, and at El Paso or Molino del Norte, where it is proposed to intersect the Rio Grande, there is an elevation of 3,725 feet. Or if the crossing should be forced by circumstances as far up as Frontera, some six miles further, the altitude of the river would be 4,375 feet, the Ranch building itself being 3,800 above the level of the sea. The distance by each route respectively, is 161 and 175 miles; the first passing by the foot of the Guadalupe Peak, having to overcome a height of 2,413 and 7-10 feet in 62 miles, and reach an elevation of 4,896 feet. The divide, however, between the two rivers on the line that strikes the valley of the Rio Grande, near San Eleazario, in latitude 31 deg. 35 min., appears to be much less elevated. The mountains seem broken and tapering to a considerable depression; and I feel confident that the crest will be reached at an altitude not over 4,200 feet, with moderate gradients on either side, and thus avoid the expensive cutting and short viaduct possibly requisite on the other route. These views are not simply based on statements of others, but from angular observations, taken

from the Pecos River, from the Guadalupe Mountains, from San Eleazario and intermediate points, to depressions in the ridges and isolated mountains referred to; while at the same time they are verified by an old surveyor, Capt. Ankrim, from personal examinations made by him the past year, for the purpose of a railway. The most northern of these two lines, in a short distance after turning the Guadalupe Mountains, crosses the boundary of New Mexico, and continues in that territory for some 50 miles. This may be considered under the Texas Western Charter objectionable. If so, the alternative must be the line from the Pecos, in latitude 31 deg. 45 min. But under any circumstances, further surveys will be required in order to select the best location for the road.

Three ranges intersect the parallel of 32 between the Pecos and Rio Grande. First the Guadalupe and Sacramento range; 2d, Sierra Hueco; and 3d, mountains of El Paso or Sierra de los Organos. The two last are much broken, and in detached parts towards the south. The Organ mountains are not crossed on either of the proposed lines, but turned at the point where the river breaks through and forms the pass of the Rio Grande. The Guadalupe range is more conspicuous, forming a break at latitude 31 deg. 50 min., where there is an abrupt and precipitous cliff of columnar rock, upon vast limestone terraces, attaining a height of 1000 to 1500 feet above its base, with a general elevation of several thousand feet above the plain. It can be seen at a great distance, owing to the clear and rarified atmosphere of the country. The face of this stupendous structure is perpendicular, and looks as if it had been shaped by some sudden and powerful convulsion of nature into the

form of a large edifice or church, from which we gave it the name of Cathedral rock. Viewed from the deep gorge below, it is truly sublime and beautiful—its lofty peak towering to a great altitude, and crowning the terminal point of an extensive range of mountains. At the foot of this cliff is one of the routes proposed for the Pacific railway between the Pecos and the Rio Grande on the parallel of 32 deg. To the southeast the mountains taper into butes or conical hills and spurs, forming depressions, which I have already referred to, near the parallel of $31\frac{1}{2}$ deg.

The Sierra Guadalupe is the commencement of the Rocky Mountains, the back bone of the continent, and extension of the great "Sierra Madre" of Mexico. The Rio Pecos drains the eastern slope until it joins the Rio Grande in latitude 29 deg. 45 min., when the latter river pursuing the same course, receives the waters from this side of the "Mother Mountain," until it discharges itself into the Gulf. The Rio Grande takes its rise west of this ridge, and flows south over the great table for eight degrees of latitude, when it turns abruptly, and breaks through to the east, at the Great *Canon** in latitude 29 deg.; thence it pursues a northward course, till its junction with the Pecos. I have crossed the spur of the Sierra Madre, separating the Pecos from the Rio Grande, at a point much further south of my recent reconnaissance, at what is known as "Wild Rose Pass," where the elevation is 5765 feet.† The altitude of the pass near the Guadalupe Peak is 4896 feet; some 869

* *Canon* is pronounced *canyon* and means a tube or flue of a chimney; but is applied to deep cuts or breaks in the ground, or gorges and ravines and defiles through mountains and hills. The more proper application would be *canada* in many instances, signifying *glen* or *dale*.

† Altitude determined by Col. James D. Graham.

feet lower, and a few hundred feet less than the *lowest* summit pass west of the Rio Grande. The *divide* between the waters of the Atlantic and Pacific, is north of Cook's *Guadaloupe canon*, nearly an equal distance from the river that the Texas *Guadaloupe Pass* is east of it. Thus, after crossing this first Ridge, bordering the Pecos, we are fairly upon the great mesa or plateau of the continent, the most elevated table land to be overcome on the whole route, having a width of 5 degrees of longitude, at the parallel of 32. Intervening, there are various elevations and depressions, but no uniform descent towards the Pacific. The nature of the country changes before reaching the Rio Grande, into granite and basaltic formations, as observed in the Organ Mountains, and Volcanic rocks of the Jornada del Muerto near Val Verde; which characteristic continues westward to the Gulf of California.

From the Pecos River to the Guadaloupe Mountains, a distance of 62 miles, there will be an average ascending grade of 31 and 2-10 feet, for thirty-five miles; and for 27 miles a rise of 45 and 4-10 feet per mile. Thence by one or two practicable and easy curves round the south base of the peak, there will be for 7 miles a descent of 91 feet per mile, and for 15 miles to the level of the plain near Ojo del Cuervo, (Crowspring?) a grade of 54 and 7-10 feet per mile. Descending more to the northward by the slope of the mountain, lower grades may be obtained. There will be from the Pecos river along Delaware creek, several culverts and some rock excavation, and at the curve of the Guadaloupe Mountain, considerable cutting and filling; possibly a short viaduct, the material necessary for the construction of which is found on the spot.



From the Crow spring to the Sierra del Cornudas (Horn Mountain) there would be an ascending grade for 30 miles of 37 4-10 feet per mile. This Sierra is named from a horn-like point at its Eastern end, and it contains vast natural reservoirs of good water. It is a small and isolated mountain of Feldspatic character, similar to the Sierra del Alamos—(mountain of the cotton-woods)—9 miles further west; to which there is an ascending grade of 35 and 9-10 feet per mile. Thence to the Sierra Hueco (Hollow Mountain) 24½ miles, there is a descending grade of 10 and 4-10ths feet only to the mile; *the first 17½ miles very gently undulating, with an average rise of a few feet per mile; thence for 3 miles ascent of 52 feet to the mile; and descent of 75,6 feet per mile for 4 miles; thence to edge of Mesa bordering on Rio Grande is a descending grade of 44,5 feet per mile for 13 miles and for 8 miles over Mesa, descent of 6 feet per mile; thence for 4 miles to river bank, 50 feet per mile, depending upon height of bridge necessary to cross the river.* At the Hueco Mountain Pass there will be some rock cutting and rough clearing, but nothing very objectionable. Should the route by the Guadalupe Peak be selected, when the preliminary surveys for locating the road are made, then the line described from Mustang Springs to the Pecos River would follow nearly an air line west to the mouth of Delaware Creek. I am inclined to believe, however, that the route to the Rio Grande by San Eleazario, and following the rich valley up to El Paso, will be considered most expedient, avoiding the heavier grades and cutting through the Guadalupe and Hueco Mountains.

In this *Section* there are vallies and extensive plains, covered with the mezquit and grama grasses, of great

exuberance, and which retain their nutritious qualities through winter and summer. Along the mountains and ravines are springs of excellent water, and large timber, and at the base of the Guadalupe Peak, pine and post oak grow to a respectable size. The soil, too, in many places, near salt ponds and springs, though covered with a disagreeable efflorescent white substance, is of a dark rich loam, a few inches below the surface, rendering it capable of great value as an extensive pasturage, as well as for horticultural purposes.

An intelligent resident of Texas, in a publication some years ago, thus graphically describes the country after ascending the plateau from the valley of the Pecos river:—"The face of this table land is diversified by conical mounds and hills, many of which have timber on them. Standing far apart, they make no break of any importance in the valley, and offer no impediment to the procurement of a good level road. Bold running streams of pure clear water, whose banks are fringed with trees and shrubbery, presenting the appearance of pool, ripple and lake, now creeping through reeds, grass and flowers, and now tumbling from a ledge of rocks, giving to circumscribed spots, scenery of wild and singular beauty—water the slope from the Sierra Guadalupe to the Pecos.

"This mountain lifts its head high above its neighbors. The southern end can be seen near 100 miles, and will be a great land mark for travelers. Large pine, Savin (Sapin?) oak and other trees cover its summit, sides and base. Granite, marble, limestone, and an immense amount of other stones, are met with.

"Specimens of the mineral ores are frequent. Talcose slate, with a trace of the black oxide of silver in it, can

be seen cropping out from the sides of ravines and barrancas."

The valley of the Rio Grande in the vicinity of the 32d degree of latitude, and for 100 miles, is capable of sustaining a large and prosperous population. It grows fine wheat, corn, fruits, and a variety of vegetables, all of the best quality, and is proverbial for producing excellent grapes, from which a native wine of very good quality is made. Some that we obtained at El Paso could not be excelled by that produced in California. There are between 15 and 20,000 Americans and Mexicans already in the neighborhood of El Paso, and the valley is highly cultivated; for many miles, a continuous garden, with fine apricots, peaches, pears, plums, and various other fruits abounding.

The length of the proposed railway from the Eastern borders of Texas to the Rio Grande at El Paso is 783 miles, and the following estimate for its construction will not, I believe, be far from the actual cost. They are like estimates from similar surveys of the other routes, only approximate, but computed from close observation, and reliable data, and I have every confidence in the amount not being under-estimated.

With proper judgment and economy, and a faithful management of affairs, the amount stated, will, I am satisfied, construct and put in complete running order, a railway from the eastern to the western limits of Texas; and be built throughout, in a thorough, substantial and workmanlike manner, with necessary drains, culverts, bridges, viaducts, crossings, turn-outs, stations, watering places, and all other appurtenances; including Locomotives of great speed and capacity, commodious and comfortable passenger cars, and freight cars adapted to the

business to be done ; and equal in all respects to a road of the first class when thoroughly organized for business. These estimates may *appear* large in some items and small in others, but they are founded upon a knowledge of the local peculiarities, favorable and unfavorable, in each section. In the first section there are a number of gullies, ravines, creeks and streams, some with bottom lands, requiring trestle work, others with culverts, &c., which will increase the average cost per mile of graduation and bridging proportionately. The second estimate for grading is not so high, for the reason that the country is more open and not so much broken, occasioning less excavation and embankment ; and still more favorable is the next 100 miles from Fort Chadbourne.

Preparing the road bed from Mustang Springs to Pecos river over the Staked Plain, will be very light; but from the river Pecos to the Rio Grande, considerable allowance has been made from the fact of the comparatively heavy grades, extra cutting and filling, and the great cost of wagon transportation for necessities required in the advance graduation of the road ; all of which will enter largely into contractors' estimates. It may be expedient to use cross-ties of timber found near Fort Chadbourne, or to the East of it, and hence additional allowance for cost of transportation on the road, as the same progresses. They may be had of sufficient durability however, at more convenient points, such as near the Guadalupe mountains, and the short distance to be hauled may prove more economical.

The estimate for iron is based upon the supposition that it can only be deposited at the Eastern end, by water from New Orleans.

Approximate estimate for constructing and equipping a railway from the Mississippi waters to the Rio Grande.

FIRST DIVISION—PACIFIC RAILROAD.

From the eastern boundary of the state of Texas to El Paso on the Rio Grande del Norte—783 miles.

COST OF CONSTRUCTION.

To Fort Chadbourne, 407 miles from eastern borders, near Shrevesport.

	PER MILE.	
200 miles grading, . . .	\$5,000	\$1,000,000
207 " " . . .	4,500	931,500
Ballasting, grubbing and clearing, 700		284,900
Cross ties or sills, (2,600 per mile) 1,500		610,500
Laying and distributing iron and ties,	750	305,250
Bridging streams, (Sabine, Neches, Brazos, Trinity, and forks of the Colorado of Texas,) including abutments, &c., .		150,000
		<hr/> \$3,282,150

To Mustang Springs, 100 miles west from Fort Chadbourne.

	PER MILE.	
Grading 100 miles, . . .	\$4,000	\$400,000
Ballasting, &c.,	500	50,000
Cross ties,	1,600	160,000
Laying and distributing iron, &c., 750		75,000
Bridging Oak creek and branch of Colorado,		10,000
		<hr/> \$695,000

To the Pecos river 115 miles west from Mustang springs, (across Llano Estacado.)

	PER MILE.	
Grading 115 miles, . . .	\$2,500	\$287,500
Ballasting, 115 miles, . . .	500	57,500

Laying iron ties, &c., - - -	800	92,000	
Cross-ties, - - - - -	1,800	207,000	
		<hr/>	644,000

To El Paso, 161 miles westward from Rio Pecos.

PER MILE.

Grading 60 miles to Guadalupe			
Pass, - - - - -	\$8,500	\$510,000	
Grading 101 miles to the Rio			
Grande, - - - - -	8,500	858,500	
Ballasting 161 miles, &c., -	500	80,500	
Extra graduation, and masonry,			
possibly a short viaduct, at the			
foot of Guadalupe Peak, -		100,000	
Cross-ties, 161 miles, -	2,000	322,000	
Laying and distributing iron and			
ties, - - - - -	1,000	161,000	
Bridging the Pecos river, -		6,000	
		<hr/>	2,038,000
Cost of iron (delivered at starting			
point of road, water navigation)			
for 783 miles of 65 lb. rail,			
(114 and 4.10 tons per mile,)			
\$80.00 per ton, - - -		7,166,016	
Wrought iron chairs and spikes,			
at \$400 per mile, - - -		313,200	
		<hr/>	<u>7,479,216</u>
Total graduation and masonry,			
bridging and superstructure of			
Line through Texas to El Paso, - - -			14,138,366

EQUIPMENT.

First class engines, 100 -	\$10,000	\$1,000,000
Freight and baggage cars, 1,500	750	1,125,000
Passenger cars, 150, -	2,500	375,000
Passenger and freight depots, -	-	500,000
Passenger and freight stations,		
buildings and machine shops,		
machinery and fixtures, engine		
and car houses, - - - - -		550,000

Engineering and contingencies,	-	2,000,000	
			<u>5,550,000</u>
Total cost of first class road, fully equipped, for 783			
miles through the state of Texas,	-		<u>\$19,688,366</u>
Average cost per mile,		\$25,144.	

The following table which I have compiled from authentic sources, will show that none of the northern or north-eastern roads can be taken as a comparison to arrive at an estimate of the cost of this.

There is a wide difference in the expense of railroads in various sections of the country. Those of the six New England States range from an average of \$30,978, to \$52,289 per mile, and a general mean of over \$40,000 a mile. Those of New York, New Jersey and Pennsylvania, from \$31,670 to \$43,505 per mile, with a general mean of \$39,435; while Indiana, Illinois, Ohio, Mississippi and Tennessee, only average \$18,991 to \$22,622, with a general mean of \$20,692 per mile. Virginia, North and South Carolina, Georgia and Alabama, average from \$17,971 per mile, to \$19,722, with a general mean of \$18,663 per mile. This great difference is owing to the various local and natural causes acting in favor of the southern roads. The great expense of most of the northern railways, does not arise from the original cost, nor would it be a fair guide to their cost if constructed at the present time, for many alterations and improvements have taken place in them, creating additional expense, together with other causes helping to swell the amount.

Land damages also constitute a very large item upon the northern roads, as for instance in the State of New York, where it averages \$4,000 a mile, and which would not enter into the expense of a road through Texas, the right of way being donated by the State for 200 feet

wide—and where, if the road were obliged to run through ground previously located, owners will be glad to donate roadway, for the sake of having it convenient to their lands.

The Richmond and Danville railroad, one of the most substantial first class roads in the country, which has just been completed, cost \$23,000 a mile, fully equipped with a heavy rail, and there was much cutting and masonry upon it. Therefore, allowing for every contingency, I cannot be considered to have estimated too low. Illinois Central railroad cost \$20,500 per mile, and would be a much better criterion to go by than any other road that I know of, from the general similarity in the country to that of the State of Texas.

Average cost per mile of Railroads in different States.

Maine,	\$33,608.89	}	\$40,880.16
New Hampshire,	30,983		
Vermont,	43,167.80		
Massachusetts,	45,760.07		
Connecticut,	39,536.08		
Rhode Island, (only 50 miles in operation)	52,289.60	}	\$39,135.44
New York,	\$43,505.43		
Pennsylvania,	43,140.42		
New Jersey,	31,670.50		
Indiana,	\$10,822.00	}	\$20,692.15
Illinois,	20,839.71		
Ohio,	22,622.02		
Mississippi,	18,991.61		
Tennessee,	20,186.80		
Virginia,	\$19,722.07	}	\$18,663.75
North Carolina,	17,771.68		
South Carolina,	19,132.21		
Georgia,	18,155.70		
Alabama,	18,037.10		

There would be no interruption by seasons of snow or cold, no malignant diseases or tropical suns to interrupt the prosecution of the out-door work, winter or summer; neither would there be any tunnelling, extensive bridging

or heavy cutting and embankment to prevent a continual laying of superstructure.

Therefore, assuming sufficient roadway to be in readiness, with cars to transport the cross-ties and rails to depots; and light hand-cars that can be lifted off and on the work for distributing the same, it would not be extravagant to state that a mile a day of the superstructure can be laid; making less than three years to the Rio Grande. Allowing 18 months for preliminary surveys, location of road, and advance graduation necessary for commencement of superstructure, and less than five years will be required to connect the Eastern and Western limits of Texas by a railway (783 miles long,) reaching half way to the harbors of the Pacific coast, from cities of Arkansas and Louisiana, and the navigable waters of the Mississippi; where roads from the north and east will long before that period be constructed to.

Adjacent to the proposed points of intersection of the Rio Grande, are numerous towns and settlements, such as San Eleazario, Isletta, Socoro, McGoffinsville, Franklin, Molino del Norte, (Hart's Mills,) Frontera, Fort Fillmore, Las Cruces and Dona Anna, on the east side of the river; and the town of El Paso, and the villages of the Mesilla, etc., on the west bank of the Rio Grande. There are also the products of the mines of the Organ mountains, distant 45 miles, as well as those of Janos and Corolitas; the transportation of troops, supplies and mails to New Mexico; the trade of Chihuahua and Sonora, besides the great mails to California and Oregon, and overland emigration from the valley of the Mississippi, that would necessarily (by the saving of time and expense) be transported on this road, if simply to terminate at El Paso;—for it would be less than 800 miles to the Pacific

coast. These, with the local travel and traffic (transportation of cotton, wheat, etc., which at present amount to a great deal, and increasing in a short time an hundred fold in the northern part of the State), would render it not only self-sustaining, but producing as profitable returns as any other road in the United States, free as it must be from all competition for a long period to come.

By way of Baltimore and Washington from New York, and over the Alexandria extension, and east Tennessee and Virginia railroads, intersecting the Charleston and Memphis route at the Tennessee and Georgia boundary, there will be nearly an air-line southwest; thence to Memphis it is nearly west. There are nearly 700 miles of this route completed, and the balance, 362 miles, progressing; 210 miles of it being the Charleston and Memphis road, and that, fully expected to be in running order by 1st of January, (1856.)

From Memphis via Little Rock, to Fulton in Arkansas, not far from the beginning of the Texas road, is 270 miles, which are already surveyed for a railway and provided for. These will connect with the road through Texas, before that line is completed. It is only necessary to glance at a recently compiled railroad map, to observe the situation of these routes, and be convinced of this fact.

Then, by constructing the road to the Rio Grande, we shall have a continuous and almost direct line from New York to the river crossing at El Paso—of 2153 miles, and which, at an average locomotive speed of 20 miles an hour, (express train), would take four days and 11½ hours.

From the Rio Grande (El Paso) to junction of the Gila and Colorado rivers it will be 550 miles, and through

the Gadsden purchase will enable us to overcome easily in $5\frac{1}{2}$ days (allow six,) by a fine coach road that can, with very little expense, (\$100,000 at most,) be made over firm ground, nearly level, with all the necessary watering stations, bridging, &c.

Thence to the harbor of San Diego (or to San Pedro,) 210 miles by way of the road, (150 miles in a straight line,) two days will be required, (allow three days.) By steamers then to San Francisco in 36 hours, (allow 2 days.)

New York to Memphis, 1067 miles, at 20 per hour.*	2 days $5\frac{1}{2}$ hours.
Memphis via Arkansas and Texas, to El Paso on the Rio Grande, 1086 miles, at 20 per h'r,	2 days 06 hours.
El Paso to junction of Gila and Colorado by Post Coaches, 550 miles,	6 days 00 hours.
Thence to San Diego (or San Pedro) by Post Coaches, 210 miles,	3 days 00 hours.
San Diego to San Francisco by steamer, 550 miles,	2 days 00 hours.

Total time from New York to San Francisco, 15 days $11\frac{1}{2}$ hours.

Thus, by railway through Texas, and thence by coaches to San Diego, shortening the time of present transit (ocean route) from five to eight days, saving a distance of several thousand miles travel, avoiding the fevers of the Isthmus, and without traversing foreign soil.

At any time by an increase of speed, for which I have allowed ample latitude, we can with equal certainty and safety reach San Francisco in 12 days from New York, or in 10 days from Memphis and the centre of the great valley of the Mississippi.

The mails then from the northern states, the eastern, western and southern states, will alike be accommodated

*Equal to 30 miles per hour at 16 hours per day, leaving 8 hours for rest, stoppages, &c., or about 25 miles per hour, and 4 hours in 24 for stoppages, &c.

to California and to Oregon ; and passing entirely through our own territory, arrive at their destination eight days earlier than by the present foreign and circuitous routes, if the Texas connection with the Rio Grande is made.

Having a thorough knowledge of the country and several years experience of every mile to be traveled from El Paso to the Pacific, I know this can be done. Illinois, Ohio, Indiana, Missouri and the West will not be obliged to send their mails a thousand miles to the east before they can have them start for the Pacific ; but by their railroad connections, will be able to concentrate at once on the main stem in Texas.

It likewise would enable the government, at comparatively little additional expense, to send off dispatches, and command conveyances to our western possessions at any time, tri-weekly or daily.

I have not presumed that the great bulk of passengers and freight from the Atlantic coast, now carried by the steamers over the Isthmus, will be drawn away by this route, until the railroad is extended 578 miles further to the junction of the Gila and Colorado, and where steamboat navigation can be had; or, until the whole line of railway to the Pacific coast is completed.

As regards obstructions by Indians, I do not apprehend the least difficulty. Few hostile bands reside immediately along the parallel of 32deg. N. latitude. If any, they are not permanent, but have their established homes to the north or to the south, and only occasionally cross it to commit depredations.

The number of men that will be required for the construction of the road, and the settlements and towns that will precede and follow its completion, together with the necessary military posts afforded by the Government, for

the protection of its citizens, will overawe these savages, and force them to abandon their predatory habits.

The incursions below this line against our distant settlers, and the unprotected neighboring Mexicans, are made by comparatively few Indians.

I am confident from personal experience and knowledge of the various tribes I have allusion to, that five hundred of our troops appropriately armed, equipped, and rationed, with a system suitably regulated to this peculiar service, and full discretion allowed to the commanders, might establish perfect safety and peace from the Sabine to the Pacific. With 10 to 25 persons I surveyed the entire route across the continent, without the loss of an animal or man by Indians, and through the country most frequented by them.

The State of Texas having granted sixteen sections (640 acres each,) to every mile of road constructed, and the lands along the line for the first four hundred and fifty miles, valued at least at seven dollars and fifty cents per acre, (\$7,50) including town sites, stations, &c., when the railway is completed, the very large amount of thirty-four millions five hundred and sixty thousand dollars, will thus be realized, for not much over half the length of the road. Then for 333 miles, (balance of the route to El Paso,) being not so well timbered and watered, might very safely be set down at three dollars per acre; equal to ten millions two hundred and twenty nine thousand seven hundred and sixty dollars; amounting to at least forty-four millions seven hundred and eighty nine thousand seven hundred and sixty dollars (\$44,789,760), worth of land given as a bonus for the construction of a railway, which I have shown, will cost less than twenty

millions of dollars! Such a munificent donation must undoubtedly secure the building of this road.

In proceeding to show the feasibility and practical advantages, of constructing a railway west from the Rio Grande, I will demonstrate, that the entire route from the navigable waters of the Mississippi to the Pacific coast, at San Pedro or San Diego, will not exceed for its entire construction, the amount estimated as the value of the eight millions three hundred and fifty-six thousand eight hundred and forty acres of land granted by Texas.

There are immense tracts of beautiful country, with inexhaustible beds of gypsum and valuable coal-fields embraced within the belts (140 miles wide by 450 miles long,) reserved by Texas for railroad purposes, and which emigration and speculators have not yet reached, and where every acre donated to the company can be selected, and made available. In the belt reserved for similar purposes between the parallels of 30 deg. 30 min. and 32 deg. (west of the first reservation,) there are no settlements and locations at present made in the rich valley of the Pecos, or the vallies nearer the mountains.

When it is considered that the lands granted by the government, 6 sections to the mile, which constructed the Illinois Central Railroad, sold at an average of more than 10 dollars an acre, I am certain that the estimate placed on the Texas lands under the superior privilege by which they can be selected, is much too low; but, as in the case with estimates I submit for building the road through the state, (placed at an extreme cost); so I prefer to err in favor of those who may be most affected by it.

On arriving at the Rio Grande, it became necessary to remain a short time and recruit our animals, which

were somewhat flagged by the fatigue of the journey. I learned at El Paso, that an order had been issued by Mexico, to the commandants of the frontier posts of Sonora and Chihuahua, to respect all parties sent out under the auspices of the Government, connected with the Pacific railroad surveys, during the treaty then pending with the United States; and that General Garland, commanding the department of New Mexico, was authorized and requested to have an exploration made with that view. It may be well here to note, that the permission from Mexico to pass through her territory, for such purpose, had not been granted when I left Washington in October, and my only resource now, was to consult Gen. Garland.

Soon as it was possible for me to obtain a conveyance, which was the 19th of February, I set out for Albuquerque, the head-quarters of the General; and following the Rio Grande some 250 miles, visited the proposed crossing at Frontera, at the town of Mesilla, at Dona Anna, and also Isletta, thirteen miles below Albuquerque. At the latter place I had an interview with General Garland, who, upon examining his powers, and after due consideration, gave me authority to make the exploration to the Pacific.

While awaiting return conveyance to El Paso, for the purpose of continuing the survey, I availed myself of General Garland's hospitality; and in addition, he afforded me an opportunity of visiting the Placer mountains, and the *canon* through which it was proposed to carry a railroad to the Pacific, by way of Fort Smith, in Arkansas, and Albuquerque, New Mexico.

The fourth day after reaching Albuquerque, I was enabled to start back to my encampment at El Paso,

where I arrived the 12th of March, and found my party in excellent health, and our animals in fine condition.

From Robladero, 10 miles above Dona Anna in latitude 32 deg. 27 min., N. to San Eleazario in latitude 31 deg. 35 min., I examined the river for the best railway crossing, and made a survey of the falls at Molino del Norte or Hart's Mills, two miles above the town of El Paso; which point, I concluded had greater facilities for bridging, than any other on the Rio Grande.

Previous to my starting up the country, I had the pleasure of meeting at the Molino, Captain John Pope, of the Topographical Engineers, who was preparing to make a survey from El Paso to Preston, on Red River, for railroad purposes. We had examined the river at the mills together, and observed that the nature of the ground, and stone requisite for foundation and piers, offered every facility for the construction of a substantial bridge. Captain Pope's course was to follow the Guadalupe Pass and the Delaware creek to its mouth, thence across the Staked Plain to the head springs of the Colorado. This line from the Rio Pecos would be about 16 miles above the crossing I propose for that river, and 20 miles north of the Mustang Springs.*

*Since the above, I have seen the report of Captain Pope and quote the following views of that accomplished officer, of the country, over which he passed, from the Rio Grande to Red River.

"Water is found at intervals not to exceed twenty-eight miles between the Rio Grande and the Guadalupe mountains, and from the western base of the mountains to the Pecos abundant springs of water, both fresh and mineral, occur at much shorter intervals.

"Timber of large size is only found immediately contiguous to the 32nd parallel on the east side of the Guadalupe range, where abundance of pine of the largest size faces their eastern slope; but fuel of

Having shown the advantages of the Texas railway connection with El Paso; and that it would be a

the best quality, and which is alone used on the lower Rio Grande, is furnished by the roots of the mezquite.

"The table-lands are covered with the mezquite brush, whose roots are numerous beyond conception, and are of a size varying from one inch to five inches in diameter. As a fuel they are uncommonly fine, and are alone used in the settlements from Dona Anna to San Elizario. As many persons, from ignorance of this fact, have suffered for wood in the midst of this abundance, it is proper to state here that all the table-lands of New Mexico furnish this fuel, and that it can be procured with very little trouble in any part of the country.

"The grama-grass, which exists in the most profuse abundance over the entire surface of these table-lands, is nutritious during the whole year, and the plains between the Rio Grande and the Pecos seem intended by nature for the maintenance of countless herds of cattle. Although little protection from Indian depredations has been afforded, and incalculable quantities of stock have been driven off by them, the number appears to be undiminished; and as the original cost is small, and the expense of feeding nothing, cattle and horses are the most abundant possessions of the people of New Mexico.

"A good wagon road, with water at convenient intervals, and offering facilities for travel available at any season of the year, leads from the valley of the Rio Grande at El Paso to the Pecos, near the 32d parallel.

"The valley of the Pecos at this parallel of latitude is a level plain of fertile soil, about two miles in width, destitute of timber, and bordered on each side by table-lands about fifty feet high, which descend into it by very gentle inclinations. The river itself is about forty yards wide, and, with a general direction to the south-east, it traverses its valley from side to side in a very tortuous course. Its bed is a compact limestone, over which it descends with a depth of about two feet, through numberless rapids, and at one point near the mouth of Delaware creek, over a fall of two and a half feet. The valley is very fertile and susceptible of a high state of cultivation, the uniformity of its surface and the peculiar character of the stream affording unlimited facilities for irrigation.

"A short distance below the 32d parallel the valley widens to several miles in extent; the rocky bed of the river disappears, and is replaced by falling banks ten feet in height, and by a soft muddy bottom. The few fording places below the mouth of Delaware creek are very unfavorable at the best season of the year, and during high water are absolutely impracticable. From the accounts of those who have crossed the river by the route from San Antonio to El Paso, and from my own examination of it for one hundred miles below the 32d parallel, it is quite certain that no point below affords anything like the facilities for *fording* as does the crossing at the mouth of Delaware creek.

"The Llano Estacado along the line of the 32d parallel (as indeed everywhere else) is destitute of wood and water, except at particular points during the rainy season; but a close examination of its geolo-

profitable investment, independent of the undertaking to the Pacific from the Rio Grande; I will now en-

gical features—the detailed results of which will be found in their appropriate place—exhibits the practicability of boring artesian wells at as many points on its surface as would be desirable. The peculiarly favorable character of the ground along the route of the 32d parallel, the directness of this route over it, and the difficulties to the north and south would seem to present inducements eminently favorable to the construction of these wells. For thirty miles east of the Pecos, the surface of the plain is hard, and covered with grama-grass; and from thence to a point about thirty miles west of the head of the Colorado the hard surface alternates, with patches of dark red sand, covered with a coarse bunch-grass, about two and a half feet high. Although the sand packs readily into a hard surface, the passage over it for the first time with loaded wagons, and embarrassed by the bunches of high grass, was laborious in the extreme.

“The Llano Estacado presents no inducements to cultivation under any circumstances; but with a supply of water at reasonable intervals, it would offer, though in a less degree than the table-lands to the west, facilities for the raising of stock.

“*Of the country between the Llano Estacado and the valley of the Red River.*—The space between the eastern base of the Staked Plain and the Red River, at the parallel of 34 degrees, is occupied by that portion of northern Texas drained by the tributaries of the Colorado the Brazos, the Trinity and the Red rivers. With rapidly increasing advantages as you proceed eastward from the Llano Estacado, this region is well-timbered, well-watered, and possessed of a soil of extreme fertility, capable of sustaining a dense population. The entire country is so gently undulating in its surface, and presents such an abundant and well-distributed supply of wood and water, that it can be traversed in any direction with trains of wagons, and is of so genial a climate that little choice of the seasons is considered desirable in undertaking an expedition through it. A great portion of the timber of the region intersected by the Colorado and its tributaries along this route is the mezquite, which about thirty feet in height and from six to ten inches diameter, divides about equally with the prairie lands this entire district of country. The Brazos and its tributaries are better supplied with oak timber of a larger size; the country is more undulating, and the water more abundant. Immense coal-beds, of good quality, crop out along the valley of the river, and every natural advantage of soil and climate is offered to the emigrant. A military post (Fort Belknap) has been established upon this stream, near the 33d parallel. But by far the richest and most beautiful district of country I have ever seen, in Texas or elsewhere, is that watered by the Trinity and its tributaries. Occupying east and west a belt of one hundred miles in width, with about equal quantities of prairie and timber, intersected by numerous, clear, fresh streams and countless springs, with a gently undulating surface of prairie and oak openings, it presents the most charming views, as of a country in the highest state of cultivation, and you are startled at the summit of each swell of the prairie with a prospect of groves, parks, and forests, with intervening plains of lux-

deavor to prove that it is not only feasible, but eminently advisable to continue this railway to California; and that if the first division will pay, how much more the completion of the entire line will add to the profits of the road through Texas.

uriant grass, over which the eye in vain wanders in search of the white village or the stately house, which seem alone wanting to the scene.

"The delusion was so perfect, and the recurrence of these charming views so constant, that every swell of the ground elicited from the party renewed expressions of surprise and admiration.

"It may seem strange that a region suggestive of such florid description should still remain so nearly uninhabited; but it must be remembered that this part of Texas is yet but partially explored, that it is far from the markets, and that it is still infested by bands of hostile Indians. A full knowledge of its startling beauty, and of its amazing fertility, and the construction of facilities of communication with a market, will soon convert this charming region into a reality, of which nature has exhibited so beautiful a presentment."

SECOND DIVISION.

FROM THE RIO GRANDE TO THE NAVIGABLE WATERS
OF THE PACIFIC, AT THE JUNCTION OF THE GILA
AND COLORADO RIVERS.

*Frontera near El Paso in latitude $31^{\circ} 48\frac{1}{2}$ to the Valle
de Sauz, in latitude 32° ; 150 miles westward.*

To cross the Rio Grande at Hart's mill—known as Molino del Norte—would require a bridge about 400 feet long; with embankments thrown out from the bluffs or hills, for a distance of 100 feet at each end. Should the road be located on the Northernmost line from the Pecos, which I have described as the Guadalupe Peak route, it will curve round the southern point of the mountains about five miles off, and by a side-cutting gradually descend from the Mesa along a ravine to the bluffs near the mill, at any desired height. The Mesa or table bordering the valley of the Rio Grande is 373 feet higher than the river; and along wide ravines which are conveniently located on each side, the distance to overcome this by a railroad would be about 6 miles; making descending gradients for the approaches to the crossing, of 62 feet per mile. This would be modified, however, by elevating the bridge, which can be done with little additional expense, the side-cutting of the hills through a conglomerate of sand and gravel. Stone, suitable for the piers, is close by. The river bottom is rocky and firm, and better suited for bridging than any point I have examined on the Rio Grande. The current is

not strong, $1\frac{1}{2}$ to 2 miles the hour, and no fear of damage from freshets, drift-wood, or ice.

The opposite side, however, is Mexican Territory, being the head of the Acequia, or irrigating canal of the town of El Paso, and two miles below the boundary. This may cause the road to follow the river some six miles to Frontera; the last three miles being through a rough *canon*, or over ridges and deep gullies, requiring considerable cutting, with heavy excavation and embankment.

Frontera, three or four miles above the limits of Mexico, is also a favorable point for bridging, and upon our own territory; but the ascent from the valley to the table land is more abrupt. By extending the route along the bluffs, however, to reach the level of the plain, convenient grades may be had. Stone, for all masonry necessary, may be quarried on the spot, but timber must be brought from the mountains forty miles distant. This can be hauled 15 miles to the river and floated down. Cotton-wood, the chief growth on the Rio Grande, although of a different character from that of Red River and the East, and durable enough for temporary use in this climate, is not found of sufficient size in the neighborhood for bridge purposes; but will answer very well for cross-ties, and will no doubt be used for such if only temporarily. I am of the opinion, however, that bridges of iron will be found most expedient. They may be made in sections, and transported on the road, when built to this point, and very little detention need occur in setting them up, if the foundation and abutments are prepared in advance.

The route which I propose from the Rio Grande, for a railway, in about 85 miles west, is crossed by

the old copper mine road, leading from Santa Rita del Cobre near the head of the river Gila, to Janos and Corralitas, towns in Chihuahua 60 miles south. At the point of intersection is a spring called Ojo Carrasalia (Carrisal? land of Reed Grass.) Forty-five miles further, the route crosses La Playa (the Beach,) or Dry Lake, at copious springs, upon Cook's road from Santa Fe to San Diego; thence in five miles the summit of the divide between the waters of the Atlantic and Pacific oceans is reached; the Rio Grande on one side, flowing into the Gulf of Mexico—and the Rio Santa Domingo, or Rio Sauce, (called by various names,) a tributary of the Gila, on the other side.

Six miles, over a gentle slope from the summit on the same course, this line enters a deep gorge in the range extending from the Guadalupe canon to the black Mountains of the Gila, and turning north-west, continues nine miles by a more rapid descent along the western slope to the "Valle de Sauz" (Valley of willows.) This valley has numerous springs of good water, and extends entirely to the Gila, a distance of 60 miles north-west, ranging in width from eight to ten miles.

The little stream that takes its rise in the Cienaga del Sauz (willow swamps) where we encamped, ramifies in numerous veins for some miles, until it forms into a regular channel, and although not generally a living stream, has plenty of water for all purposes necessary to make it valuable for grazing. I have traced this arroya for a great distance, and in 1851 encamped upon it, near the Gila, when proceeding to survey a portion of the United States and Mexican boundary.

The ground along this section alternates from a sandy soil to occasional loam or clay, and is almost the whole way covered with grass; in many places the rich grama, and in others a coarser or less nutritious kind. There is no permanent drinking water found at the surface immediately adjacent to the line, except the different springs mentioned, where there is abundance, and every appearance of its being had by wells at other points. Lakes of alkaline water, which would answer for locomotive use, were found.

Fifty-five miles from the Rio Grande, and fifteen below this route, is found a small stream of pure water, that takes its rise south of Janos, in Chihuahua, runs north to the latitude of 31deg. 35 min., where it turns suddenly east, thence south until it sinks into the ground a mile from *Lake Guzman*. It has a large and beautiful valley, at its north bend, with excellent soil, and huge alamos or cotton woods growing on its borders. It will, no doubt, become a valuable and desirable grazing district.

At the north-west edge of Lake Guzman, is a delightful warm spring, the water, when cooled, very excellent to the taste. A few steps below where it gushes from the ground, is a wide basin about five feet deep, sufficient for twenty persons at a time to bathe in. It is constantly flowing, and of just the right temperature. Our party enjoyed themselves much during the few days I was detained here, determining its position and exploring the mountains on either side.

There is no timber after leaving the Rio Grande, nearer this line than the Sierra Florida and Burro mountains, 30 to 40 miles north, and on the Rio Guz-

man, (or Rio San Miguel, as it is called at Janos), until we reach La Playa springs; where, 10 miles south in the Sierra de los Animas, are found plenty of oak and pine. The Chiricahua range, which, on the west, faces the "Valle de Sauz," ten miles from the terminus of this section, is covered with a similar growth. It may prove more profitable, however, to use the timber of the Rio Grande, than haul any distance by wagons. The cotton wood will, unquestionably, last two years in this climate after being laid.

From the edge of the mesa, at the river, there is only a rise of 315 feet in 128 miles, making an average grade of $2\frac{1}{2}$ feet to the mile. Several intermediate undulations and one or two low ridges, separating depressions in the plain occur, all which are very gradual. The ascent from the Dry Lake is 268 8-10 feet in five miles, making 53 7-10 feet to the mile, the maximum gradient necessary on this section. From the summit, for five miles west, there is a gradual fall of 11 2-10 feet per mile, when, through the gorge and to the willow-springs, a distance of 17 miles, there is a descent of 589 7-10 feet, making a gradient of 34 7-10 feet to the mile.

The excavation and embankment will be light, until the approach to La Puerta, leading into the Valle de Sauz, where are black lava and granite rocks scattered about in much confusion, though offering no obstruction even to an easy transit of wagons. La Puerta, is by far the best pass in this range that I know of, and having crossed further north two years previous to my present exploration, I am satisfied, offers great facilities; besides being nearly in a right line west from Frontera, cuts off some 40 odd miles from the other

route by the town of Mesilla or Dona Anna. It is hidden from sight, until reaching the *divide*, when it suddenly opens to view.

Had that indefatigable officer, Col. Cooke, in his famous march across the continent for the first time with wheel vehicles, known of this pass, he would have been saved the Herculean labor of forcing his way through the impracticable Guadalupe *canon*. Our encampment for the night was three miles off; and as we trailed through it at early sunrise next morning, one of the arrieros exclaimed, "*La Grande Puerta*"; and from its being the *first* opening upon the Pacific waters, I named it *La Puerta*—the door. None of the party, but myself, had previously been in this section of country, and there were no traces of any one having passed through it, until now. The altitude of the summit of the divide is 4,714 feet, and the greatest elevation of the *door* is 4,657 feet.

We are now over the great table; and from the highest shelf of the Rocky Mountains in this latitude, have descended one step of the Pacific slope. Between the meridians 104 deg. 50 min., and 109 deg. west longitude from Greenwich, lies this elevated Mesa. The eastern borders, resting on the Pecos, are the Guadalupe and Sacramento mountains, one hundred miles from the Rio Grande; and western limit, the range running north from Cooke's Guadalupe *canon*, in which is the pass of *La Puerta*.

In this distance of nearly 255 miles, there are no elevations to overcome above those of the two borders; 4,896 feet (summit of Guadalupe pass), and 4,714 feet (summit five miles west of the Ojo del Playa, or Dry Lake of Col. Cooke.) It will be ob-

served that the highest altitude of the great plateau on this route, is east of the Rio Bravo del Norte, and in Texas; and this is the greatest elevation above the sea (4,896 feet,) that need be ascended to reach the Pacific coast, if the line to the San Pedro, by way of the Dome Mountain pass, through the Chiricahua range (hereafter described,) is determined upon as the most expedient; and thence by Cooke's road *via* Tucson to the Gila.

From the Valle de Sauz to Santa Cruz Valley, — miles.

The lofty granite range of the Chiricahua mountains—through some pass of which the road must be made—forms the entire western boundary of the Valley of Willows. It extends in a northwardly direction to the parallel of 32 deg. 27 min., where a deep indentation occurs several miles wide; when, rising suddenly again, it reaches its greatest eminence, Mount Graham, whose peak is intersected by the meridian of 109 deg. 47 min. west longitude; and thence continuing on the same course to the great *canon* of the Gila, it becomes blended with the Pine Plain mountains (Pinal Llano) of the Apaches. It is the most extensive and well-defined range between the Rio Grande and junction of the Colorado and Gila rivers.

I will here remark, that on the eve of my departure, I received a note by express from Major Backus, commanding Fort Fillmore, some 45 miles above El Paso, informing me of the arrival of Lieut. Parke from California, on the survey of a route for the Pacific railroad. Through this very thoughtful and kind act of Maj. Backus, I was enabled to see Lieutenant Parke, and learn from him the direction of his explo-

rations. He had completed his field work, and very generously turned over to me an excellent cistern barometer, one of two which he had brought with him for the determination of altitudes. This was a valuable accession to my other instruments. It had got a little out of order, from the bottom of the glass tube not having been cut the proper length, being rather long; but through the ingenuity of Captain George Stoneman, commanding Lieut. Parke's escort, it was repaired, and afterward worked well, giving good results, having tested it with accurately determined points.

Lieut. Parke's route from the Valle de Sauz to El Paso, was partly the road made by us (Boundary Commission) in 1851, far to the north of the line now explored by me, and some 40 miles longer. From the San Pedro river, his line was also the one traveled by us that year. I had, therefore, in addition to my own, the benefit of his examinations of the Pass del Dado, and having also traversed the Chiricahua mountains, through the defile near Mt. Graham, in latitude 32 deg. 27 min., and satisfied that no other practicable pass for a railway, existed northward, I determined to seek a passage in the opposite direction, which might prove more favorable.

The camp was moved across the valley to the mouth of a bold and rugged *canon*, ten miles from the Sauz springs, and facing La Puerta. Abundance of pure water was found by us, and a couple of men whom I sent to explore, returned with the information that a mile above, was a mountain stream, fringed with large pines, and the ground carpeted, as it was all around us, with luxuriant grama. This grass, though of last sea-



son's growth, was yet very nutritious, like the best of hay at top, and perfectly green for several inches from the ground.

The view of this *canon* in the morning, with the sunlight reflected from its deep recesses, and upright walls rising on all sides to a height of several thousand feet, tapering like spires amid the clouds, majestically, presented a scene of grandeur and beauty rarely excelled. The mouth of the *canon* is a mile wide, and a line of alamos and willows extending some distance into the plain, marks the course of an arroya which is filled with large boulders; indicating it, in the rainy season, to be a rapid torrent.

In looking over the wide valley to the mountains, on the east side, it was difficult to tell which way this arroya turned; there was a slight elevation all the way, and it sloped almost imperceptibly to the right and to the left. I subsequently discovered that this slight divide separated the waters of the Yaqui river, upon which the old ranche of San Barnadino is situated, from those of the Cienaga del Sauz, or willow swamps of the Valle de Sauz. The Yaqui river empties into the Gulf of California, near the Port of Guaymas, in Sonora.

From the *Grand Canon* we followed along the base of the mountains, examining minutely every break that appeared the least encouraging. Finally, a large opening was discovered, with an arroya whose banks afforded an excellent road, and ascending gradually, we came to a spring having cotton-woods and a few sycamores about it. From this point, through a broad and beautiful defile, with a very gentle ascent, we rose to the summit of a fine Pass, through which an ordi-

nary coach could be driven without the necessity of locking the wheels. This pass led us by an equally gradual descent into the wide valley and plain of the "Playa de los Pimas." Near the summit is a red rock of gigantic dimensions, and singular beauty. Our arrieros called it "Cerrillo Colorado," the Little Red mountain. Its lower part is of conical form for 400 feet, from whence it rises with nearly perpendicular sides 300 feet higher, and is crowned with a massive dome of symmetrical proportions. Standing isolated and alone, it becomes a prominent land-mark, easily recognised, from the hills east of the old rancho of San Bernadino; from whence it bears N. 53 deg. W. (magnetic), and distant about 20 miles. Opposite, and south of the spring, are high vertical cliffs of porphyry, resembling pallisades. This pass, which we called the *Pass of the Dome*, has a summit elevation of 4,826 feet; less by 402 feet than the altitude of Paso el Dado, determined by Lieut. Parke with the same instrument. It is the lowest of the three passes through this formidable chain of mountains, along the base of which I have now skirted from the extreme north to its southern terminus. Below the Paso del Dado, it is covered with timber of forest oak and pine, and in the gorges and ravines, are sycamore, walnut and cedar.

The arroya which we followed to reach the Dome Mountain pass, is a tributary of the Rio San Bernadino. The spring, where we made our noon halt, is 40 miles S. W. of La Puerta. Chiricahui mountains are almost entirely of granite, with much feldspar; as in the case of Grand Canon; which, from disintegration, presents a curious serrated appearance. Towards the

lower or southern end, there are trap dykes and basalt in irregular and confused directions, showing a powerful volcanic action, at some long period back.

Recent Indian signs were numerous; large numbers having lately camped at the springs of the *canon*, and trails were running in every direction. I recognized at once the familiar print of the square-toed moccasin boot of the Apache. Our number was small, but very compact, thirteen all told. I had divided the party for the purpose of running two lines, when we struck Cook's road. We were to join again at the valley of Santa Cruz. The others numbered the same, well armed and mounted.

Crossing the valley of the Playa de Los Pimas on a west course, we entered a gap in the low range bordering the San Pedro, 37 miles from the summit of the preceding pass, and almost a right line west. From thence by a broad Indian trail, we descended a grassy dale, to the Rio San Pedro, 11½ miles. The elevation of the San Pedro pass is 4731 3-10 feet. The valley of the Playa de Los Pimas is here firm soil, with less sand than where I crossed it further north. At the lowest depression are a number of arroyos, two to three feet wide, which in the rainy season are filled with water and flow northerly to the Playa, which latter is somewhat similar to the "Dry Lake" of Col. Cooke. There was no water in the valley this month, (April,) unless by digging, which we had no means of doing and no necessity for. There is a scrubby growth of mezquite and oak, where we first entered, but no timber for railroad ties. The soil is of a reddish clay, and generally good, with abundance of grass.

The San Pedro river, where we struck it, in latitude 31 deg. 34 min., is a small stream at this stage, about eight feet wide, and shallow; between steep banks 10

feet high and 25 to 50 feet apart. It is good water here, but further down, where much alkaline matter is associated with the earth, it is a little brackish and not so pleasant to the taste. At three points that I have crossed it, it is a living stream, with large fish. At its mouth, where it joins the Gila, it spreads into passes, forming a sort of diminutive delta. Occasional bunches of mezquite and cotton-wood are seen upon its borders, and in the neighboring ravines higher up towards the old San Pedro ranch, are found walnut and ash. Abundant springs and large districts of grama were frequently met with from half-a-mile to a mile off. During an encampment of a month, in 1851, at what we called the San Pedro springs, some miles below our present ford, our animals fattened and recruited rapidly.

There were large haciendas and fine cattle ranches in this neighborhood, until a war of extermination was declared by the Apaches against the Mexicans. Remains of the old San Pedro ranch, are seen at this day; also the "Tres Alamos;" and the ruins of the hacienda of Babacomeri, whose walls and towers are still standing. These were among the wealthiest of Sonora in horses, cattle, sheep, etc., but it has been many years since. It is a fine grazing region, with wild cattle and mustangs constantly seen roving over the plains.

The district from San Pedro to Santa Cruz valley, nearly due west from our present crossing (latitude 31 deg. 34 min.), will be to the Pacific slope what the region of Fort Chadbourne, in Texas, is to the Atlantic. The mountains and hills are covered with splendid timber of the largest size, and for all purposes; and the valleys are full of springs, and the finest grass.

To Tubac, a town in the valley of Santa Cruz, it is 69 miles. This is by following the San Pedro about a

league, passing over a few insignificant spurs, and ascending the Rio Babacomeri; thence continuing westward by a gradual rise over delightful plains to the divide between that and the Sonoita or Clover creek, and along the latter, until it loses itself in the porous earth, a mile from the Santa Cruz river, and by the broad valley of that stream to Tubac.

This line I explored the last season, also that by the emigrant wagon route from Cooke's road into the town of Santa Cruz; which latter route was found impracticable for a railway, beside being partly in Mexico. The other, proved perfectly feasible, although the summit elevation between the Babacomeri and Sonoita creeks, was greater than we had reached in crossing the mountains east of us. It passes through the most desirable region, with the hills and mountains for forty miles, containing inexhaustible quantities of timber. We noticed tall cedar, and oaks of every description; one kind more interesting than the others, being a white oak from twenty to forty feet in the body. Pine and spruce, with superior white ash and walnut, were found, and the most gigantic cotton-woods, particularly on the Sonoita.

The atmosphere is pure and healthy, and the climate agreeable winter and summer, except in the immediate vicinity of the town of Santa Cruz, where there are swamps hemmed in by high mountains. This town is some distance from the line spoken of, and south of the national boundary. The mountains in the neighborhood are filled with minerals, and the precious metals are said to abound. The famous Planchas de Plata and Arrizonia silver mines, which the Count Rousett de Boulbon attempted to take possession of, are in this section of country, not many miles below the present limits, and at

several of the old ranchos and deserted mining villages which we visited, were found the argentiiferous galena ore and gold.

The Sierra Santa Rita runs along to the east of the Santa Cruz valley, and forms a part of this interesting region. It is very high and bold, filled with fertile valleys and flowing rivulets, and covered with a dense growth of timber. I saw much of this district, when here in 1851, on the survey of the boundary.

As there are two routes explored from the Sauz valley to the valley of Santa Cruz, one which I have described, leading to the town of Tubac, and the other to the town of Tucson, I will remark that the Pass del Dado route is the shortest; but by the Dome Mountain pass to the San Pedro river, there will be lower grades, less cutting and lighter work. From thence by the Babacomeri, and Sonoita tributaries, the line would be through far the most interesting country, offering great facilities in timber and cultivable land, though of higher elevation.

Surveys, more in detail, than a mere reconnaissance to determine the practicability of the road, may show that it is expedient to pursue the line direct to Tucson through the del Dado pass, and thence to the Gila, striking it above the Pimas villages. In either case it will not alter the line I recommend from the Rio Grande to the Sauz valley.

With regard to gradients, they will average as follows: From La Puerta to lowest depression in the Chiricahua valley, south-west course 26 miles, 27 feet to the mile. To head spring of Dome mountain pass, 32 miles, 13 feet per mile; thence five miles to summit, 63 feet to the mile; thence to the lowest depression of Playa de los Pimos valley, 27 miles, at eighteen feet per mile. For

six miles, grade of 54 feet per mile; to summit of San Pedro mountain pass, 15 feet per mile for four and a half miles; and to the river bank, $11\frac{1}{2}$ miles, at 43 feet per mile. From the San Pedro to Babacomeri rancho, $15\frac{1}{2}$ miles at 25 feet per mile; to Wild Peas spring, 10 miles, at 48 feet per mile; and to summit before reaching the head of the Sonoita, 43 feet per mile for $5\frac{1}{2}$ miles. From summit of Sonoita springs, $4\frac{1}{2}$ miles at 86 feet per mile; down the Sonoita for $15\frac{1}{2}$ miles, average grade of 61 feet per mile; down same creek for $10\frac{1}{2}$ miles at 38 feet per mile; and thence by valley of Santa Cruz to Tubac, $12\frac{1}{2}$ miles at 26 feet per mile.

The pass into the valley of the Playa de los Pimas, will require some blasting in hard rock, but only at short intervals cutting off points of the bluffs; and also some excavation in softer rock west of the San Pedro. Again, at the Sonoita creek, one or two places will require heavy clearing of matted vines and large cotton-woods, also a slight cutting through a short *canon*. Comparatively there will be required very little clearing or grubbing; with but one stream to bridge, that of the San Pedro.

From Tubac, in Latitude $31^{\circ} 37' N.$, to the Junction of the Gila and Colorado.

To follow the valley to Tucson would be nearly a north course for 43 miles, with a descending grade of 26 feet per mile, the altitude of Lieut. Parke's camp, near Tucson, by barometer, No. 392 being 2,300 feet, while near Tubac, the same instrument gave, after a series of observations which I made with it, an elevation of 3,380 feet. To continue to the Gila river, would be a distance of 90 miles, with an average gradient of 20 feet to the mile. From this point the Gila has a fall for 215 miles, to its junction with the Colorado, of about 6 feet to the

mile. By leaving the river at the Pimas villages, and passing over a low spur of the Sierra de los Estrellas, a large bend in the Gila is cut off, saving a distance of 35 miles. The distance from river to river would be 53 miles, without any difficulties to overcome, and a maximum grade not exceeding 50 feet to the mile. Thence down to the junction it is a clear way, with here and there a side cutting through mixed sand and clay.

Water, on the level plain from Tucson 90 miles, is scarce, but there is no doubt of its being procured by wells.

Having previously examined the Gila river to the junction, I was desirous to know the nature of the country near the head of the Gulf, and to see if a line could not be carried from the Santa Cruz valley, on a direct course to Fort Yuma; or at any rate, to a point on the Gila below the great bend, which would shorten very much the route by way of the Pimas villages.

It was now late in the season, and the dryest part of the year, (May.) To the rancho of Bosani I shaped my course, where I learned there was an old Indian trail northward, striking the river some distance below the Pimas villages; also another trail further west, from Altar, which came out at the junction of the Gila and Colorado. Bosani I found to be in latitude 31 deg. 10 min. 25 sec., and south of our present limits, though at the time of my exploration, no new boundary had been negotiated. It is south-west about 50 miles from Tubac, and situated 46 miles above the town of Altar, at the head springs of a stream of the same name.

From this rancho, I sent a party to the Gila, which they struck at the west end of the little Jornada, below the big bend of that river. They found villages and

planting grounds of the friendly Papigos, and grazing vallies with numerous wells of water; rough gullies and ravines were encountered, and the country on both sides much broken, with no extensive ranges of mountains, but distant and isolated ridges.

After obtaining some good astronomical observations, and making further reconnaissances, I proceeded with remainder of the party down the beautiful valley of Altar. Fine wheat is raised here, and almost every variety of vegetables and fruit grow readily. Several very respectable looking towns, with highly cultivated fields and gardens were noticed, and before reaching Tubitami are fine missions and ranchos deserted on account of the Apaches. From Altar to the Gulf of California, where there is represented to be a good harbor, it is 55 miles. To Guaymas are vallies and plains running the whole distance. I found no difficulty in the way of a railroad to the Gulf, the maximum grade not exceeding 70 feet to the mile.

The locality of this region had never been correctly determined. Some good observations which I got, places Altar in latitude 30 deg. 42 min. 25 sec. north. From this place to the junction of the Gila and Colorado, we ran a line, passing by the gold mining town of Zonia, and through an extensive mineral district. Sonoita, by my observations, in latitude 31 deg. 51 min. 19 sec. north, and a short distance below the limits of our territory, is an Indian town, where the Gobernador of the Papigos resides. There are also a few Mexican families. The valley is broad, with springs, and a small stream (the Sonoita) which flows a few miles in the dry months, when it sinks, like the river of San Diego in California. During the rainy season it extends for a long distance to-

ward the Gulf. Near Sonoito, but within our own territory, are copper mines of surpassing richness. Some 40 pounds of the ore which I brought away, was of the red oxide of copper, producing 71.8 per cent. of metal. It was represented to yield gold of great value; but from an analysis of a specimen by Doctor Chilton, it exhibited no such indications.

The Indians represent rich Placers existing throughout this region, and large numbers of them had lately come in with considerable quantities of the dust. They were trading it off for trifles to the Mexicans. I got some specimens of it which was the same as the California gold. This was not the time of year (June) for them to work the mines, but in the fall, after the rain has commenced. The greatest drawback to the profitable working of the Placers of this district, is the scarcity of water. If artesian wells succeed, there is little doubt that it will create an important change. West from Tucson and Tubac, toward the Gulf of California, the country presents more the appearance of a barren waste or desert than any district I have seen. It nevertheless has occasional oases, with fine grazing lands about them, and the mountains which are more broken and detached, have distinct marks of volcanic origin. The ranges though short, have generally the same parallel direction as those further east.

It is the country of the Papigo Indians, a peaceful and friendly tribe, extending down to the Gulf coast, where they are mixed up somewhat with the Cocopas of the Colorado. From Sonoita I explored to the Gulf Shore, near the mouth of Adair Bay. It was 62 miles, following a dry arroya most of the way, and the point at which I struck the Gulf was in latitude 31 deg. 36 min. 34 sec.

The "Bay" is about 15 miles across, and from all I could learn 15 miles long, and represented as having 4 fathoms of water. It is completely encircled by a range of sand hills, reaching north-west to the Colorado river, and south-east as far as the eye could discover. These "sables" are probably 80 or 90 miles in extent, by 5 to 10 broad.

Notwithstanding it appears to be the most desolate and forlorn-looking spot for eighty miles around the head of the Gulf, the sand hills looking like a terrible desert, nature seems even here, where no rain had fallen for eight months, to have provided for the sustenance of man, one of the most nutritious and palatable vegetables.

In this naked spot, I found a band of Indians (Papiagos) almost in a state of nudity, living on fish and crabs caught in the salt creeks and lagoons of the Gulf; and a sort of root, which was ate after roasting upon hot coals; or dried in the sun, and ground on a metate (curved stone) with mezquit beans, forming "Pinoles." In the latter state it was not so palatable as ours made of parched wheat or corn; but the vegetable itself, when first gathered and cooked, was very delicious, and resembled in taste the finest sweet potato, only far more delicate. It was very abundant in the hills, all, except the top buried in the sand, apparently attached to some other root or substance. Professor TORREY, of New York, to whom I submitted a specimen, discovered that it was *an underground parasite*, constituting a "*new genus of the small groupe or family represented by the little known and anomalous Corrallophyllum of Kunth, and the Pholisma of Nuttall, in the floral structure, and the scales more like the latter, from which it is distinguished by its woolly*

plumose calyx and its singular cyathiform inflorescence." The name agreed upon for this remarkable plant is *Ammobromo Sonora*, signifying sand food of Sonora.

Fifteen miles from Adair Bay is an immense bed of lava and volcanic stones, burnt and twisted into every conceivable shape; also a large and distinct crater. In some of the cavities of these rocks, we came across vast natural tanks of delicious water, and discovered an extensive field of obsidian (volcanic glass,) from which I procured some very interesting specimens.

The country from Agua Salado, 20 miles below the ranche of Sonoita, to the junction of the Gila and Colorado, is marked by long stretches of level plains, lying between ridges of rocks containing much feldspar and mica, which from disintegrating has formed a sandy and gravelly soil.

The mountains for the first fifty miles have a peculiar whitish appearance, spotted over their summits and sides with myriads of black boulders, from the size of a paving stone to that of a ton weight, and occasionally very large masses. These rocks seem as if they had been ejected during the eruption of some powerful volcano, and showered like hailstones upon the surrounding country. At one place I found in the feldspatic rocks quantities of small but very perfect garnets.

Water is very scarce, this being the dryest section of country between the Atlantic and Pacific oceans, only raining occasionally in the months of July, August and September. It is not often any one travels this region, and, indeed, we were told by the Indians that our's was the first party of whites that had ever pen-



etrated the sand hills to the head of the Gulf. There can be no inducement for one to attempt it again, unless it be the mineralogist or botanist, to whom alone it may possess some interest.

East of the *Tinaja Alta* or high tank range, lie the famous Sierras del Aja, now in United States territory. These mountains derive their name from the vast deposits of red oxide and green carbonate of copper found about them, and which the Indians have made use of to paint (ajo) themselves with. These mines are unquestionably of great value, and must become important, more particularly from their being situated in the neighborhood of the contemplated railway. Indeed, from the town of Tubac or Tucson, northwest to the Gila river, through this mineral region, I am confident no difficulties exist, but will be found most expedient for the locality of the line, cutting off 70 miles from the Pimas village route. The two reconnaissances made from Tubac, through that country, satisfied me that there are no impassable barriers. No other timber than cotton-wood, willow and mezquit, is found in this section.

The tall cereus giganteus and agave Americana are found in abundance. From the latter plant the natives make the pulque, mezcal and agua-diente; and the petahaya or cereus, produces a fruit from which is made a very pleasant preserve. At the Pimo and Maricopa villages are found wheat, corn, tobacco and cotton, besides melons, pumpkins, beans, &c.

The nature of the soil for great distances in the Gila valley is of a reddish loam; some parts coated with a beautiful crystallization of salt, a quarter to half an inch thick. This seems to be more particu-

larly the case below the Maricopa villages and toward the Rio Salado. The cotton, of which I procured specimens, though cultivated by the Indians in the most primitive manner, exhibited a texture not unlike the celebrated Sea Island cotton. Its fibre is exceedingly soft and silky, but not of the longest staple. Large tracts of land on the Gila and in other portions of this district, appear to possess the same properties of soil; and where, I have no doubt the finest cotton will soon be extensively raised and brought to its highest state of perfection by proper cultivation.

There are no heavy grades or difficult excavation and embankment to encounter between the Santa Cruz valley and the mouth of the Gila; and no short curves. Water, on the line over the plains till reaching the river, is scarce, only found at long intervals; but, like the other stretches described, are favorable signs of its existence not many feet below the surface. For railroad purposes, there will be no difficulty in always obtaining a sufficiency.

In estimating the time required, and the cost, to construct a railway from the Rio Grande to the Colorado river, I have studied closely the climate and resources of the adjacent country; as well as noting peculiarities in the nature and topography of the ground, over which the contemplated road must be built.

SECOND DIVISION.

Approximate Estimate for constructing and equipping first class road from the Rio Grande to the navigable waters of the Pacific at the junction of the Gila and Colorado rivers—578 miles.

GRADUATION, MASONRY, AND SUPERSTRUCTURE.

Frontera, near El Paso, (lat. $31^{\circ} 48\frac{1}{2}$) to Valle de Sauz, 150 miles.



Grading, including grubbing and clearing, 130 miles @ 5,000,	\$650,000
Grading, including grubbing and clearing, 20 miles @ 8,000,	160,000
Bridging the Rio Grande,	50,000
Cross-ties for 150 miles @ 2250,	337,500
Laying and distributing iron and ties, 150 miles @ 1000,	150,000
Ballasting, 150 miles @ 500,	75,000
	<hr/> 1,422,500

Valle de Sauz to Santa Cruz Valley, at Tucson, 135 miles.

Grading, grubbing and clearing, 40 miles @ 8,000,	320,000
Grubbing, grading and clearing, 95 miles @ 5,000,	475,000
Extra cutting and filling Paso del Dado,	50,000
Bridging Rio San Pedro,	6,000
Cross-ties, 135 miles @ 2,250,	303,750
Laying and distributing iron and ties, 135 miles @ 1,000,	135,000
Ballasting, 135 miles @ 500,	67,500
	<hr/> 1,357,250

Tucson to the junction of the Gila and Colorado via Pimas villages, 293 miles.

Grading, grubbing and clearing, 90 miles @ 4,000,	360,000
Grading, grubbing and clearing, 203 miles @ 4,500,	913,500
Cross-ties, 293 @ 2,250,	659,250
Laying and distributing iron and ties, 293 @ 1,000,	293,000
Ballasting, 293 miles @ 500,	146,500
Wrought iron chairs and spikes, 578 miles @ 450,	260,100
Cost of iron delivered at mouth of the Gila, (water navigation) 65 lb. rail, 114, 4 tons to the mile, \$100 per ton, 578 miles @ 10,296, 5,951,088	<hr/> 8,583,438

EQUIPMENT.

First class engines, delivered in California, 75	
@ 10,500, - - - - - -	787,500
Freight and baggage cars delivered in California, 1,000 @ 1,000, - - - -	1,000,000
Passenger cars in California, 100 @ 3,000,	300,000
Passenger and freight depots, - -	250,000
Passenger and freight stations, buildings and machine shops, machinery and fixtures, engine and car houses, - - - -	300,000
Extra water and fuel stations, - -	200,000
	<hr/> 2,837,500
Engineering and contingencies, - - -	2,000,000
	<hr/>
Total cost of 2nd Division fully equipped, - -	\$16,200,688
Average cost per mile, 28,028.	

Graduation and masonry for the first 130 miles of this division will be in light sand and gravel soil, over the level mesa, reaching to the divide between the waters of the Atlantic and Pacific. For 20 miles there will be somewhat rougher excavation, and clearing of boulders through the pass of La Puerta, besides five or six miles of side cutting to descend to the level of Valle de Sauz. The estimate, it is fully believed, will cover all contingencies.

Cross-ties may be furnished, either on the spot, from the cotton-wood of the Rio Grande or Rio Gila, (for temporary use,) or supplied along the road from the Colorado river, where a depot can be established, accessible by water. At Bodega, a short distance above San Francisco, saw-mills and inexhaustible quantities of tember, might furnish ties, which shipped to the Gulf of California, will cost less than hauling any distance overland. Transportation by wagons, of iron or cross-ties, twenty miles, will not pay, unless under

the most favorable circumstances of road and locality. Temporary tracks may be laid, in the valley of Sauz, to *canons* of the Chiricahua mountains, or to the Santa Rita range, for the purpose of making use of the fine timber of that region. The most unfavorable condition, however, will require ties to be transported on the road as it is being built, not over 578 miles. This is under the supposition that the 2nd division will be in progress of construction at the same time with the Texas and California portions. Full allowance in either case is made. Grading from the valle del Sauz, except in the paso del Dado, the *canon* leading to the San Pedro river, and the northern slope of the Sierra Santa Rita, will be similar to that from the Rio Grande. Where the exceptions are made, a proportionate increase has been allowed, together with extra amount for cutting and filling. From Tucson to the Gila will be light, over a very regularly descending surface. Water will be required here, which if not got by wells, must be provided for by tanks in the rainy season, or hauled. The estimate is considered sufficient, from the otherwise favorable nature of the ground. Many points and bluffs must necessarily be excavated, or have side cuttings along the Gila valley, to shorten the road as much as practicable, and hence an increase over the previous section.

In the Santa Rita mountains, a few miles south of the proposed route, between Tucson and the San Pedro, I found great abundance of the largest sized pine and oaks. Very little ballasting will be necessary, as the climate and nature of the soil is so constituted as to scarcely require it.

In this division it would be difficult to decide from the reconnaissances made thus far, which route will be

found most expedient to cross the Chirricahua mountains; though sufficient data has been obtained to show entire feasibility of either route. Further surveys will unquestionably develop lines more advantageous and less expensive throughout the whole length of the road. From pass La Puerta, it may be found best to follow the valley of Sauz to latitude 32 deg. 27 min., and enter the Playa de los Pimas through the pass of Mt. Graham, by which Lieut. Whipple and myself traveled in 1851. I then noticed depressions in the ridge bordering the Rio San Pedro, south-east of the Black mountains, and gorges leading directly to that stream may be discovered practicable for a railroad; in which case the valley of the Gila could be struck much higher up than the Pimas villages.



THIRD DIVISION.

Junction of the Gila and Colorado rivers to San Diego or San Pedro on the Pacific Coast—260 miles.

I have partitioned the route from Eastern Texas to the Pacific into *three* divisions, because of the accessible points by water communication, at which all necessary materials for constructing the road can be landed; namely: the commencement at Caddo Lake, (navigable waters of the Mississippi;) the Gulf of California or Fort Yuma on the Colorado river, opposite the mouth of the Gila; and San Diego or San Pedro on the Pacific coast. The first division is entirely within the limits and under the control of the State of Texas; the second through the territory of New Mexico; and the third that of the state of California. The latter comprises the bridging of the Colorado; crossing the "desert;" and the passage of the coast range of mountains.

About three hundred yards beyond the point where the Gila unites with the Colorado, the latter stream appears to have forced its way through a hill of solid rock, chiefly porphyritic, with compact crystals of feldspar, seeming as if by nature placed for the abutments of a bridge. The river at the gorge is only 350 feet across, yet a hundred yards above or below, widens to seven or eight hundred. A single span will require about 400 feet, with an elevation of some forty or fifty above low water mark.

This is the only site adapted for a railroad crossing of the Colorado, below the Gila, on this route. On the west or California side, upon the top of the hill, which is the most elevated position, (75 feet above the river,) is situated Fort Yuma, established by Major S. P. Heintzleman, in 1850. It is a permanent garrison, and a number of persons have settled about it. The bottom lands of the river are wide, and the soil of the richest character, with inexhaustible resources of water for irrigation. To the head of the Gulf of California it is about 80 miles, at which point large vessels can anchor. There is over the bar only five feet at low stages, but for small draught steamers, it is navigable at all times some distance above Fort Yuma. Forests of mezquite, cotton-wood and willow, line its banks. The usual wagon route across the Colorado desert, follows down the river for seven miles, and passing south of the boundary, continues along the edge of a sand bluff for 50 miles in Mexican territory. For the railroad, a line from Fort Yuma north 30 deg. west, for 20 miles, leaving Pilot Knob to the south, and thence westward, would be upon our own territory, and over a firmer portion of the plain, with no inconvenience from sand, which during the prevailing blows from the north-west, floats in clouds for great distances.

It is 85 miles to the springs of Carrizo creek by this course, and which may be considered the width of the desert. No water exists on the surface, and to obtain it by wells, would require most likely a depth of 30 or 40 feet greater than along the present wagon route; but the latter is some 10 miles longer.

To pass from Carrizo springs to the summit of the coast range of mountains, by Vallecito and Warner's

pass, would require deep cutting and heavy gradients to overcome, considered impracticable for a railroad.] From Carrizo creek, by a course S. W. for 10 miles, there would be a very gradual ascent up a firm valley to a very precipitous *canon*. From the base of this *canon*, by four inclined planes of half-a-mile in length each, we might rise to the summit, and thence through a beautiful country with fine vallies, well timbered, in 75 miles, reach San Diego, by an average descending grade of 50 feet per mile. These inclined planes may be considered objectionable; but tunnels would not be practicable, as the ascent is all on one side, and the descent gradual for 60 miles on the other. Unless from a more thorough examination of the eastern slope of this range, a pass of available grades be discovered to the plateau of the coast range in this neighborhood, the road must adopt inclined planes, or reach the harbor of San Diego by a more circuitous route.

When I reached Fort Yuma, from the Gulf of California, in June last, my animals appeared too much broken down to make as thorough an examination of the coast range as I desired, and having learned that Lieut. Williamson had completed his survey to the Colorado, I determined to pursue the road route in, and relieve my party from the arduous and difficult duties which they had so faithfully performed for five months. I had crossed this desert four times at different seasons, winter, summer and fall, and explored, instrumentally, most of the country from the desert into San Diego. But I had not gone through the pass of San Gorgonia, or by some called Weaver's pass, after the old trapper and guide of that name, whose

ranche is situated near its summit. I had also explored about the San Bernardino mountain, which is situated a short distance to the north of it, and thence to the coast at San Pedro. Lieut. R. Williamson, however, had thoroughly examined this pass, and reported it perfectly practicable—the highest summit elevation being 2808 feet above level of the sea, and heaviest gradients 132 feet per mile, for 209 miles, and 127 feet per mile, for 1,34 miles. San Gorgonia pass is 160 miles north-west from Fort Yuma, and diagonally across the Colorado desert, almost level the entire way. This desert appears to have been once the bed of an extensive lake, its centre at a lower elevation than the Colorado river, which latter probably had its original outlet into it, similar to the Sabine river and lake, of Louisiana and Texas. There are no trees to be seen upon the desert, except at the lagunas and dry bed of New river. It presents great facilities, however, for a railroad passage over it, such as straight lines of great length, and very little grading other than nature has already performed. From San Gorgonia pass it is 100 miles by the valley of Los Angeles to the port of San Pedro, and from the same pass, likewise 100 miles, to the harbor of San Diego through Temecula an Indian Rancho.

THIRD DIVISION.

Approximate Estimate for constructing and equipping a first class road from the Colorado river to the Harbor of San Diego, or to the Port of San Pedro, (about the same distance via San Gorgonia pass) 260 miles.

GRADUATION AND MASONRY, AND SUPERSTRUCTURE.

Bridging the Colorado, extra work, cutting,

&c., - - - - - \$100,000

Graduation, grubbing and clearing, 140 miles	
@ 3,000,	420,000
Graduation, grubbing and clearing, 120 miles	
@ 8,000,	960,000
Bridging, culverts, etc., over small streams	
and gullies,	150,000
Cross-ties, for 260 miles @ 2,500,	650,000
Laying and distributing iron and ties, 260	
miles, @2,000,	520,000
Ballasting, 260 miles @ 1,000,	260,000
Wrought iron chairs and spikes, 260 miles,	
@ \$450,	117,000
Cost of iron delivered at mouth of Gila riv-	
er, water navigation, 65 lb. rail, 114,4	
tons to the mile, at \$100 per ton; 140	
miles @ \$11,440,	1,601,600
Cost of iron delivered at harbor of San Die-	
go, 65 lb. rail, at \$90 per ton, 120 miles	
@ \$10,206,	1,235,520
<hr/>	
Total cost of graduation and masonry, and	
superstructure,	\$6,014,120

EQUIPMENT.

First class engines delivered in California,	
35 @ \$10,500,	367,500
Freight and baggage cars delivered in Cal-	
ifornia, 500 @ \$1,000,	500,000
Passenger cars delivered in California, 50 @	
\$3,000,	150,000
Passenger and freight depots,	250,000
Passenger and freight stations, buildings and	
machine shops, machinery and fixtures,	
engine and car houses, etc., etc.,	300,000
<hr/>	
	1,567,500
Engineering and contingencies,	1,000,000
<hr/>	
Total cost of 3d Division, (California)	8,581,620
<hr/>	
Average cost per mile, through California, \$33,006.	

In this division of the Pacific railway the first portion of the grading is from the Colorado river, over what is called the "Desert." The line proposed avoids the sand hills, and is upon firm ground, almost levelled by nature for the track of a Railroad. A small part is gravelly, and the balance alluvial soil, firmly packed, and for great distances smooth as a bowling alley. The estimate for graduation is much larger than believed will be required for preparing the road-bed; but as it will be necessary to dig for water, full allowance is made. The balance (120 miles) to the harbor of San Diego is through the coast range of mountains. After rising to the summit at Weaver ranche, near the head of the Santa Anna river, the country presents a plateau appearance stretching off towards the Indian village of Temecule, diversified with hills and vallies, and parallel ridges, continuing nearly to the coast. There are steep gullies and ravines, that will require considerable cutting and filling, with a number of short bridges, culverts, &c. Timber for cross-ties may be had upon the mesa, and from this point may be carried upon the road as it is built, a supply for the whole division to the Colorado. Minute examinations and surveys will be required to fix the most proper direction for the road from San Diego to the mesa, leading towards the San Gorgonia pass, should a route less circuitous not be found. Though the knowledge possessed for this country, chiefly from personal examinations, from San Bernardino and the Cajon pass to the boundary line of Upper and Lower California, does not warrant me in asserting that a more advantageous pass through the coast range exists further south into San Diego,

yet my firm belief is that one will be discovered that must prove more expedient. A thorough instrumental survey of each ravine and gorge will be required, in the neighborhood of Carizo creek, leading to the summit of the mountains, which circumstances have not permitted to be made. The importance of this is shown from the fact, that by a practicable railway pass in this direction, it will be about 175 miles only from the Colorado river to San Diego, allowing for all detours; shortening the line by way of San Gorgonia pass (260—175) 85 miles. This cut off, at the average cost per mile given in the estimate, would amount to a saving in the original outlay of \$2,805,510; which if added to the annual cost of maintenance and repairs, to say nothing of the value of the time saved in traveling this 85 miles, would soon rise to an enormous sum.

It is not intended to convey the impression that this amount would be saved in the event of a route leading to the port of San Pedro. The San Gorgonia pass is undoubtedly the door-way to the coast at that point, and the most direct to San Francisco. The original cost also from the summit of the San Gorgonia pass to San Pedro, will be far less in *graduation and masonry*, than from the same point to San Diego.

But to reach the fine harbor of San Diego, nearly by a direct line, would be so immeasurably superior to a detour of 85 miles, that I question if tunnels or inclined planes to a considerable extent with their improved modes of guarding against accidents, would not be preferable. The 2,805,510 dollars would enable tunnelling to be made through these mountains to an extent of five or six miles.

One of the most favorite features upon the route in the vicinity of the 32nd degree proposed for the Pacific railway is, its accessibility at all times, admitting of labor being performed in the open air at each season. The nature of the climate through Texas to the Rio Grande has already been referred to, and from thence to the Santa Cruz valley half way to the Colorado, over the elevated plateau of the Sierra Madre, it is equally salubrious and temperate. The rainy season falls in the summer months, and but seldom is snow seen even upon the mountain tops. Towards the Colorado river it is much drier and more torrid, but by no means unhealthy; nor does it prevent out door work the whole of every day during the heated term of summer. In May, June, July, August and September, at times at the eight or nine hottest hours of the twenty four, the thermometer ranges high as 100 to 110 degrees, (Fahrenheit); but the excessive dryness and purity of the atmosphere, with the absence of all malaria, makes it free from sickness. Major Heintzelman, who has commanded the United States garrison at the junction of the Gila and Colorado for over four years, informed me that it is one of the most healthy posts he has ever known, and that at all seasons his men have worked many hours of the day without being sheltered from the sun. This would be the case for 200 miles east of the Colorado, and one hundred west of the coast range of mountains; from thence to the Pacific, summer or winter, the most charming weather prevails. It would be prudent, however, to work, during the hottest months on this dry stretch, only in the cooler parts of the day; from 4 o'clock till 10 A. M. and 5 till 5 7. P. M.

Emigrants travel over it chiefly at night, and iron and ties could be laid for fully fourteen hours out of every

twenty-four. The graduation and masonry, if necessary, could be done in the winter season without retarding the progress of the road. But what appears to far more than counterbalance the inconvenience in the loss of a part of the day light, is, that nature has already graded nearly the whole of this distance, not a hill nor hardly a rock to cut through. The four times that I have traversed this so called desert (January, June and October) we experienced no sickness, nor any trouble except for the want of water. Wells are now dug and but little privation is felt in crossing it. A locomotive train would pass over it (100 miles) easily in two and a half hours, being level without a tree or a shrub to intercept the view.

For a very correct description of the climate and country in the vicinity of the proposed termini on the coast, I will quote from the *Rev. Walter Colton's* work upon California, published in 1850. Mr. Colton was a Chaplain in the United States Navy, and resided three years in that country, possessing fine opportunities for judging its merits. In speaking of the southern part of the State, he says:

"Emigrants, when the frenzy of the miners has passed, will be strongly attracted to Los Angeles, the capital of the southern department. It stands inland from San Pedro about 80 leagues, in the bosom of a broad fertile plain, and has a population of 2,000 souls. The San Gabriel pours its sparkling tide through its green borders. The most delicious fruits of the tropical zone may flourish here. As yet, only the grape and fig have secured the attention of the cultivator; but the capacities of the soil and aptitudes of the climate, are attested in the 20,000 vines, which reel in one orchard, and which send through California a wine that need not blush in the presence of any rival from the hills of France or the sunny slopes of Italy. To these plains the more quiet will ere long gather, and convert their drills into pruning hooks, and we shall have wines, figs, dates, almonds, and raisins from California. The gold may give out, but these are secure while nature remains.

"San Diego is another spot to which the tide of immigration must turn. It stands on the border line of Alta California, and opens on a land-locked bay of surpassing beauty. The climate is soft and mild the year round; the sky brilliant, and the atmosphere free of those mists which the cold currents throw on the northern coast. The sea-breeze cools the heat of summer, and the great ocean herself modulates into the same temperature the rough airs of winter. The seasons roll round, varied only by the fresh fruits and flowers that follow in their train.

"Before the eyes that fall on these pages are under death's shadow, San Diego will have become the queen of the south in California, encircled with vineyards and fields of golden grain, and gathering into her bosom the flowing commerce of the Colorado and Gila."

To speak of the accessibility and safety of the harbor of San Diego would be superfluous, for its fame in that respect is well established as the discovery of California. But in regard to its capacity with reference to being one of the termini for the Pacific railroad, it is very much misunderstood. The Bay of San Diego was entered by the Spaniards in 1602, and is thus described by those early navigators.

"On the 5th November, (1602) they fall in with four islands which they call Coronadas. On the 10th they enter the famous harbor of San Diego. The day after their arrival, Ensign Alarcon, Captain Peguero and eight soldiers are sent to explore. They first direct their steps to a heavy forest which lies on the north side of the bay. This is ascertained to be about three leagues in length and half a one in breadth. The trees are chiefly oaks, with an undergrowth of fragrant shrubs. *Obtaining a fine view of the bay from the heights, they ascertain it to be spacious, land-locked, and every way desirable; and, returning to the ships, report such to be its character.* This result being deemed satisfactory by the General, he orders a tent pitched on shore for the celebration of mass, and preparations to be made for repairing the ships. One part of the crews therefore, is assigned to clean and tallow the hulls, another to fill the water casks, and another to procure wood and keep guard.

"All desirable preparations being made, they sail from this beautiful bay of San Diego. While they have tarried in it, many of the crew who had been sick of the scurvy have recovered, and many others have died. It is a sorrowful occasion for those who still live, to part from the graves of their companions. They are interred on the borders of the magnificent forest northwest of the

bay ; and the well known trees, which spread their branches over them, are discernible as they leave the land.

* * * * *

" During the half year occupied by this expedition (expedition by sea for the conquest of Upper California in 1768) the Padre Junipero is not idle at San Diego. On the 16th day of July, 1769, he consecrates the foundation of a mission. This is the day of the year, when in 1812, the Spaniards under the banner of the cross, prostrated the power of the Mahomedans in the south of Spain ; and the good Padre Junipero hopes that the same banner shall yet wave over the Gentiles of Upper California. He chaunts the mass, celebrates the triumphs of the Holy Cross, sprinkles the ground with the baptismal water of the Church, and calls it San Diego, or Saint James."

In 1782 it was surveyed by Don Juan Pantoja second pilot or navigator of the Spanish fleet. In the summer of 1849 the shore line was accurately measured and triangulated under the direction of Hon. John B. Weller, United States Commissioner, in connexion with Initial point of the Mexican Boundary ; and spring of 1850 while encamped there, waiting instructions from Washington, I sounded the harbor thoroughly ; and in conjunction with the officers of the U. S. steamer Massachusetts extended the soundings into deep water.

Since then large steamships and men-of-war have anchored off the military depot in six fathoms water, four miles above the Playa.

In 1851-52 it was again surveyed and sounded by the United States' Coast Survey. From the results of the three examinations, it appears that the conformation of the shore line has very little if any, changed ; and the *soundings* are identically the same. The average rise and fall of tide is 64 feet, and six fathoms at low water is carried in over the bar, for a distance of eight miles up the bay ; when five, four and three fathoms are extended for seven miles further. The

channel of deep water is half a mile wide for over eight miles; at one place a little less (near the entrance.) On either side of the four fathom curve, which is distinctly marked, the bank being very precipitous, are flats having from one to three fathoms, generally averaging two fathoms, and at one bend of the bay nearly two miles broad. No difficulty is experienced in getting into the harbor night or day, with a chart or pilot; the wind from any quarter. For nine months of the year the prevailing winds are from the north-west, and during the months of November, December and January the south-easters make their appearance on the coast; occasionally very heavy storms lasting several days at a time; but when fairly in the harbor, it is as smooth as a mill-pond, and a vessel will ride more securely at anchor than in the harbor of New York, so completely land-locked and protected from all gales as it is. There are no heavy swells upon the bar and the channel is very regular. A strong current sets in and out of the harbor, and so long as the tides continue to ebb and flow, that long will the deep channel remain the same, unless by some sudden disturbance in nature a change takes place in the form of the bay.

It is simply necessary to examine a correct chart of the port of San Diego to observe at once its capacity. From a residence of several years there, and close observation, I feel satisfied that for all the ocean traffic of the Pacific, from the Islands and the Indies, it is amply capacious, being large enough to hold comfortably more than a thousand vessels at a time.

It is not because personally interested, as a resident of San Diego, that I am thus particular in describing



the harbor, for its geographical position with the great facilities which the parallel of thirty-two offers for the construction of the Pacific railway, must in the event of such being accomplished, insure for it prominence in a commercial view. But, it is because misapprehension has been felt by many that the harbor is not sufficiently capacious. This surmise has been based upon statements of persons who have not spoken understandingly or at least have not had correct information. One in particular which I refer to, is calculated to mislead from the high rank and position which the officer has held. He of course could have no intention of misinforming, but must have founded his opinion upon the common impression existing previous to the accession of California and without examination. This idea, of its being a small harbor, arose from the fact of the very little or no traffic of San Diego except for one or two ships a year putting in for hides and tallow, and occasionally for water. Inside the natural pier, so perfectly formed that it seems almost artificial, and immediately at the *entrance* of the port, was the common anchorage, because it afforded safety, and a fine beach for drying and curing hides. There was no necessity for vessels going further, and so long had it been since the old Spanish fleets visited it, that no one thought of the deep channel existing to such an extent up the bay. I am satisfied that the author of the statement referred to, if at San Diego at all, was never fairly in the harbor, but at its entrance opposite La Playa, the narrowest part in eight miles of five and six fathoms of water. Though this lower part of the bay is perfectly safe and landlocked, it is nevertheless but a small portion of the

harbor, which may be said to have a shore line on either side of four leagues at least. The Spanish fleets anchored seven miles above the entrance, and at a point where the channel lies close to the shore which they named Punta de los Muertos (Point of the Dead), from burying a number of the crews there, who had died from scurvy, contracted on the voyage.

It seems strange that the author of "Western America on Routes of Communication," if he spoke from personal examination, should have committed such an error of judgment. But as his opinion of the inadequacy of the ports of San Diego and San Francisco, and the inability of "the country around" to "furnish the necessary supplies" for termini of the Pacific railroad, has proven in the one case, (San Francisco) so erroneous, so will it be found to turn out with the other.

I do not hesitate to say that in climate it cannot be surpassed by any in the world, and for capacity and safety, there are few harbors on either coast of North America, superior to San Diego, admitting the largest class ships of war, and at all times.

The benefits to be derived from the construction of the railway along the parallel of 32 degrees north latitude, are not alone confined to the State of Texas. Incalculable as the advantages may be to her, yet every State in the Union must be deeply interested in it, as likewise the nations of Europe. The peculiar advantages offered upon this route must insure for it a great national highway, and establish it the main stem; from which at the east will branch lines to Saint Louis, to Memphis, to New Orleans, to Galveston, and to Matagorda Bay, connecting with the great

commercial cities of the Lakes and the Atlantic. Accessibility at all seasons of the year, free from the drifting snows of the North and malignant diseases of the Tropics—combines certainty and safety with speed, and must consequently command to a great extent the travel and traffic between the two oceans.

The route through Texas by way of El Paso to California would shorten the present line of travel from England to Australia via the Isthmus of Panama, 650 miles; and facilitate communication, *at least seven days*, by giving a connected line of railway for 3700 miles at the rate of twenty to thirty miles the hour; whereas, by the Isthmus, there can never be but 60 miles of the whole distance at that speed.

	D. H.
Time from Liverpool to Isthmus of Panama,	
at Aspinwall, by steamship,	18 12½
Aspinwall to city of Panama, by railroad,	00 03
Panama to Australia by steamship, 7,637 miles,	
at 200 per day,	31 20
	<hr/>
Total time by present route,	50 11½
Liverpool to Halifax, 2,417 miles, @ 240 per	
day,	10 02
Halifax to New York, by railroad,	1 06
New York to eastern end of Texas road, 1350	
miles, at 600 miles per day, (30 miles an	
hour, at 20 hours per day,)	2 06
Eastern boundary of Texas to San Diego, 1,621	
miles, at 600 miles per day,	2 16¾
San Diego to Australia, 6,500 miles @ 240 per	
day,	27 02
	<hr/>
Total time by railway through Texas to Pacific,	43 08½
	<hr/>
Difference of time in favor of Continental R. R.	7 02½

Were Galway, in Ireland, a packet station, it is shown at a railway convention, that the time of travel between

the two great cities of New York and London, could be shortened by four and a half days in connection with railways in the British Provinces.

Thus the transportation of the mails and passengers, the 50,000,000 of specie annually, and the expresses to and from *Australia* and the *South Pacific*, would be forced (by the saving of the time and interest) to follow this route. Add to this the mails, passengers, express packages, specie and manufactured articles, that would necessarily be transported by a railway to and from *California*, *Oregon* and the *North Pacific*, and enormous returns upon the outly of capital invested, would be the result.

The local trade this road would command is of no little consideration; but of itself must very soon pay well. The whole valley of the Rio Grande, from Santa Fe to the Presidio del Norte, the extensive interior of Sonora, Chihuahua, New Mexico, and Texas, would be tributary to it.

The chief products of the country adjacent to the proposed line of road through Texas and New Mexico, are cotton, tobacco, wheat corn, hemp and wool; also, cattle, horses, mules, and sheep; lead, coal, iron, silver and gold; fruits such as apples, peaches, pears, grapes, figs, etc, etc.

The Brazos river in Texas, produces the finest coal. It is five hundred miles from that section of country to the Rio Grande; ten hundred and seventy-eight to navigable waters of the Gulf of California, and thirteen hundred and thirty eight to the harbor of San Diego, on the Pacific coast. A ton of coal is transported upon the Atlantic roads at 1 to 1½ cents per ton per mile, and upon the Pacific railway it is to be presumed that it will

cost no more at least, the length of the road being so much greater and the running expenses proportionately less. Then say at one and a half cents it will cost to transport to the Rio Grande, (500 miles) \$7,50 per ton; to the navigable waters of the (2078 miles,) where it can be shipped to any part of the Pacific \$16; and to San Diego (1338 miles) \$20 per ton for transportation. Add the original cost at the mines, say \$4 per ton, and we have coal at the Rio Grande. \$11,50; at the Colorado of California, \$20, and at San Diego, only \$24 per ton, and of the very best quality. The *cost* per ton freight to the Pacific as at present is twenty four dollars from the Atlantic. It is plain, therefore, as no good coal has been found more convenient to the Pacific coast, that this will be an important item in the revenue of the road, and create a new and rich field of traffic in Texas. Another great advantage will be, that the supply can be regulated and kept constant, preventing extraordinary fluctuations in the price of that article, which under present circumstances must continue to be the case on the Pacific. I have not considered the *time* consumed in transporting coal around the Horn, which would be (130 days minus 5,) 125 days or *four months* greater than by the Texas road.

The most western settlement at present on this line is Fort Chadbourne, until reaching the Rio Grande, 376 miles. The capital of the State of Chihuahua, a city of the same name, having a population of 12 to 15 thousand in 1846, is only 240 miles from El Paso, where this road is proposed to intersect the Rio Grande. It is the centre of that department whose population was estimated by Dr. Wislizenus, at 150 to 160,000 souls exclusive of wild Indians. The principal trade of Chihuahua.

is carried on through New Mexico and Texas, where caravans of goods have to travel 1340 miles from Independence. With the road completed to El Paso *eleven hundred miles hauling* by wagons will be saved.

Arispe, a large town in Sonora, is only 100 miles in a right line south of the proposed road; and Ures, the Capital, in the heart of this rich state, is but 166 miles south. Settlements such as haciendas, ranchos, presidios, and towns are within 55 and 60 miles of the line for 240 miles west of the Rio Grande. Thence the half civilized and friendly Papigos and Pimas, extend nearly to the Colorado. The population of the State of Sonora in 1842, was 130,000, and its productions are similar to those of Chihuahua, with the addition of the sugar cane, and the tropical fruits generally—such as oranges, lemons, pomegranates, dates, &c., &c. All the grains, cattle, stock, &c., raised in New Mexico, flourish in Sonora and Chihuahua.

Grains generally are seen growing of the finest kind; but there is little or no market for them at present. While in the Valley of Altar, I hired wheat fields for our animals to graze in, when near the towns, and ordinary grass was scarce. The cost was twenty-five cents for each animal per day. Flour of an excellent quality manufactured at the Mexican mills, sold at four dollars for one hundred pounds, equal to about eight dollars a barrel. This Valley is less than one hundred miles below the proposed railroad route. Wheat would cost to haul it to a market at a railroad depot 100 miles, 15 to 20 dollars a ton.

The great riches of the country, however, are a total waste at the present time, but which the Pacific railroad will at once develop, and make to itself the foundation of

a vast revenue. I refer to its metallic wealth, the silver, gold, tin, and copper mines, that abound in almost every mountain and valley, between the Rio Grande and the Gulf of California.

The ores of Chihuahua and Sonora are chiefly sulphuret, (lead or iron), or native silver in porphyritic or statified limestone rocks passing at greater depths into igneous rocks. This is the character of the silver mines observed by Dr. Wislezenus in the vicinity of the city of Chihuahua. From loose piles lying upon the surface and evidently picked over, I procured specimens of silver and copper. Three samples representing points on the line of our exploration about equi-distance from each other, viz: the Rio Grande, the neighborhood of Tubac, and within 90 miles of the junction of the Gila and Colorado Rivers, were submitted to Doctor I. K. Chilton, of New York, for analysis. He found in one sample of lead ore (argentiferous galena), by fire essay 71 per cent of lead, and the "*lead yielded silver equivalent to 123 ounces, 1 dwt. to the ton,*" (of 2000 pounds.)

In another, he found the lead obtained from it to yield silver in the proportion of 72 ounces 5 dwts. to the ton or 2000 pounds.

The copper specimen, was the red oxide, and yielded as follows :

Copper,	71.80
Iron,	7.84
Oxygyn,	12.34
Silicia, }	
Alumina, }	8.02

100 parts.

At the junction of the Gila and Colorado, there is a small settlement about the garison; and it possesses re-

sources to make it a place of much importance. No other settlements exist in a hundred and twenty miles west, until reaching the coast range of California, whence they are scattered at intervals of twenty or thirty miles into San Diego.

The Papigos and Pimas Indians, by proper management might be made very useful, in working upon the road where there is not much rock excavation. They are unlike the Indians of Texas, or the Apaches, living in villages and cultivating the soil, besides manufacturing blankets, baskets, 'pottery, etc. Quiet and peaceable, they have no fears except from their enemies, the Apaches, and are very industrious, much more so than the lower order of Mexicans, and live far more comfortably. It is astonishing with what precision they construct their acequias—irrigating canals—some of them the *acequias madre* of very large size, and without the use of leveling apparatus, but simply by the eye. Their gardens and farms too, are regularly ditched and fenced off into rectangles and circles with the hedges and tress planted, as if done by more enlightened people. The Mexican peons can also perform this sort of labor with skill, and living as they do on *pinole* and *carne* and regularly acclimated, might be made very useful. I have seen some good stone work done by these peons in Chihuahua and Sonora.

With regard to the *feelings* of the people of this country toward the Pacific railroad, they all look upon it as the brightest prospect of their existence, and are disposed to aid and advance it to the extent of their power, and if well directed there would be immense wealth and traffic developed among them. From the Padres down, they appear desirous of seeing the enterprise consuma-

ted, fully comprehending the benefits they are to derive from employment, and a home market for their products, within sight of their doors, where they can realize enormous profits above the present value. During my intercourse with them, I found the more educated classes had acquired considerable knowledge of what was going on about a railroad to the Pacific, as well as the telegraph. The latter, however, they were somewhat skeptical about, as to its performances. *Padre Ortiz* was the Vice President of an Association at El Paso to promote its advancement, all seeming to think it would open to them a world which they had long heard of but their hopes of ever seeing had almost vanished, and looked forward to realize in it perfect happiness.

A line from the neighborhood of Tabac might branch toward Guaymus or to the harbor of Tiberon. The distance is only 225 miles. If a line direct into San Diego is adopted, instead of the detour by San Gorgonia—the branch for San Francisco would strike off about 30 miles from the Colorado on the Jornada, and follow the San Pedro road into Los Angeles. It will not be long after this main stem is established, that these branches will be formed, opening new channels of intercourse and trade.

RECAPITULATION.

*Cost of Road and Equipment through State of Texas (783 miles)
from navigable waters of the Mississippi, near Shreveport, La.
to Rio Grande, near El Paso.*

Graduation and masonry,	• • •	\$4,500,400
Bridging,	• • • • •	166,000
Superstructure, including iron,	• • •	9,411,966

Equipment: Passenger and freight stations, buildings and fixtures, including depots, water and fuel stations, machine shops and machinery; locomotives, passenger, freight and baggage cars, &c.,	2,837,500
Engineering and contingencies,	\$2,000,000
	<hr/>
Total cost of Road through Texas,	\$19,688,366
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Average cost per mile,	\$25,144
	<hr/>

Cost of Road and Equipments through Territory of New Mexico (578 miles) from Frontera, on the Rio Grande, to Navigable Waters of the Pacific, at Junction of the Gila and Colorado.

Graduation and Masonry,	\$3,217,500
Bridging,	56,000
Superstructure, including Iron,	8,089,688
Equipment: Passenger and freight stations, buildings and fixtures, including depots, water and fuel stations, machine shops and machinery, locomotives, passenger, freight and baggage cars, &c.,	2,837,500
Engineering and contingencies,	\$2,000,000
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Total cost of Road through New Mexico,	\$16,200,688
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Average cost per mile,	\$28,028
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Cost of Road and Equipment through State of California (260 miles,) from the Navigable Waters of the Colorado to the Harbor of San Diego or San Pedro.

Graduation and Masonry,	\$1,640,000
Bridging,	250,000
Superstructure, including Iron,	4,124,120
Equipment: Passenger and freight stations, building and fixtures, including depots, water and fuel stations, machine shops and machinery, passenger, freight and baggage cars, &c., &c.	1,567,500

Engineering and contingencies,	-	\$1,000,000
Total cost of road through California,	-	\$8,581,620
Average cost per mile,	-	\$33,000

Total Cost of Railway, (1621 miles) from navigable waters of the Mississippi, Eastern Boundary of Texas, near Shreveport, to the Harbors of the Pacific, - - - - \$44,470,674
Value of the Lands donated under Texas Western R. R. Charter, February 16th, 1852 (8 sections to the mile, and estimating only 8 under Act of 30th, January 1854—10,240 acres for every mile of road built) per acre, as per estimate in the first Division. - - - - \$44,789,760

The item of interest on about one half the amount of cost which will be lost in the construction of the road, will not be equal to assessments on the stock of the company.

REVENUE OF ROAD.

100 first class through passengers per day, 50 each way, @ \$100,	-	10,000
200 second class through passengers per day, 100 each way, @ \$60,	-	12,000
100 way passengers per day, 50 each way, @ \$20,	-	2,000
Total for one day,	-	\$24,000

For 300 days,	-	\$7,200,000
For transportation of specie from California and Austrulia, \$100,000,000 @ 2 per cent.,	-	2,000,000
For transportation of mails to New Mexico and the Pacific @ \$600 per mile, 1,621 miles daily,	-	972,600
For 100 tons through freight per day, 50 each way, \$80 per ton—8,000X300 days,	-	2,400,000
100 tons way freight, 50 each way, per day @ \$40—4,000X300 days,	-	1,200,000

For transportation of troops, supplies, etc., to New Mexico and the Pacific, say,	1,000,000
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Total revenue for 1 running year, 300 days,	\$14,772,600
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**EXPENSE OF MAINTAINING AND OPERATING
ROAD.**

Repairs of road and railway; of buildings, bridges, etc.; of engines and tenders, cars, tools and machinery; of iron, of fuel, oil, &c.; incidental expenses of watchmen about shops, clerks, office expenses, stationery and printing, sta- tion attendants, water supplies, conduc- tors, firemen, and laborers, switch ten- ders and brakemen, etc.; damage to goods, general superintendence, con- tingencies, etc., etc., for one year. Say 2 cents per mile for passenger, rating 300 through and 100 way equal to 350 through passengers; and freight reckoning 100 tons through, and 100 way, equal to 150 tons,	\$4,863,000
Say cost of carrying the mails, 10 tons daily,	100,000
Say cost of carrying specie (1-10)	200,000
Say cost of troops, &c., &c., ($\frac{1}{2}$)	500,000

\$5,663,000

Net revenue,	\$9,109,600
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Which on \$44,470,674, cost of road, would be 24 per cent.

It may appear that the difference between the revenue, and the cost of maintaining and operating the road is too great; but it will be seen that I have added a large per centage to the cost of the latter items over the roads of the Atlantic States. The great difference arises from the *charge of transportation* upon the Pa-

cific road, which in the estimate to California for a first class passenger at 100 dollars would make 6 cents per mile (1621 miles); while at the north it is limited to about two. It would cost a first class passenger about 160 dollars from New York to San Francisco by Texas railway to San Diego. It costs by the Isthmus steamship route 300 *dollars* besides occupying from 15 to 16 days longer time.

If we consider emigration across the plains, which the larger number if not all will be monopolized by this road, we shall have a far greater amount of revenue. It now costs an emigrant on an average \$200 for outfit, (animals and provisions); and in time 100 days to reach the shores of the Pacific. It would cost him by railroad to San Diego, \$100, including traveling expenses down the Mississippi to Texas western railroad connection; thence \$30 dollars to San Francisco, and \$30 say to the mines, including every allowance, making \$150. Fifteen days would be ample time for traveling by this route; six days down the Mississippi, six to San Diego, two to San Francisco and one day to the mines. The difference of *time*, therefore, would be eighty five days, which to the laboring man would be at least equal to \$170 in California; which sum lost by traveling horseback, makes a total cost to the emigrant of \$370 dollars; while by railroad it would cost him \$150 all told, thus saving \$220 dollars. This must produce its effect, and force two-thirds if not all by railway. It has been said that many have animals and equipage for the plains that have no other means, and they can dispose of the same on the Pacific for as much as they are worth when starting out. This is not so, the best

of stock after working across the plains, cannot be sold for more than half their actual value at the point of departure, unless it be oxen well taken care of. Admitting that their animals would bring, if they get them over, the full worth at the east, still the result would be as I have figured above. At least 25 per cent of the animals is lost entirely, by breaking down or stolen by Indians.

I have not taken any northern railway as a guide for estimating the cost of the Pacific road, as none of them have peculiarities that it can be assimilated with. The New York and Erie railroad was commenced in 1836, and only finished in the last few years, nearly 20 years completing it. At the present time all the natural difficulties encountered on that road would not prevent the construction of a similar one in five.

In the estimate for bridging, I have not assimilated it with the ordinary cost per lineal foot; but made full allowance for extraordinary expenses, high prices of material, labor, &c. The cost of carrying a passenger on the northern roads, is one cent per mile, and freight one and a half cents per ton per mile. I have allowed two cents per mile for passengers, and two cents per ton for freight. At the north, the whole cost for running a train either for passengers or freight, may be assumed at \$1,00 per mile run. I have doubled this in my estimate for the Pacific road.

The road may be made the means of transporting its own fuel, and in establishing depots of coal and wood. The coal of the Brazos would be convenient for Texas; and depots at San Diego and the junction of the Gila and Colorado, may be supplied by water, if cheaper than transporting by railway from Texas.

CHARACTERISTICS OF THE PACIFIC RAILWAY.

(From the foregoing Estimates.)

Length of Road through State of Texas,	. . .	783 miles.
Length of road through Territory of New Mexico,	578 "
Length of Road through State of California,	. . .	260 "

Total length of Road from navigable waters of the Mississippi, Eastern boundary of Texas, near Shreveport, Louisiana, to San Diego on the Pacific,	1,621 miles.
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Cost of road through Texas fully equipped,	\$19,688,366
Cost of road through New Mexico,	" " "	16,200,688
Cost of road through California	" " "	8,581,620

Total cost of road,	\$44,470,674
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Average cost of road through Texas per mile,	\$25,144
Average cost of road through New Mexico,	28,028
Average cost of road through California,	33,000

General average cost per mile of whole road,	\$28,724
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Weight of rail per yard 65 lbs.

Greatest elevation above tide water to overcome in Texas: Guadalupe pass,	4,897 feet.
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Greatest elevation above tide water to overcome in New Mexico: Paso del Dado,	5,228 "
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Greatest elevation above tide water to overcome in California: San Geronimo Pass,	2,808 "
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Altitude of Rio Pecos, lat. 31 deg. 45 min., Texas,	2,437 "
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Altitude of summit of Llano Estacado,	2,995 "
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Altitude of crossing the Rio Grande at Frontera,	3,800 "
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Altitude of summit divide between waters of the Atlantic and Pacific, 135 miles west of Frontera,	4,714 "
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Heaviest work on line: Guadalupe and Hueco Passes, Texas.

Heaviest work in New Mexico : Paso del Dado and Santa Rita Mountains.

Heaviest work in California : from summit of Mesa to San Diego.

Steepest gradient in Texas, 91 feet per mile for 7 miles.

Steepest gradient in New Mexico, 194 feet per mile for $2\frac{1}{2}$ miles, (surface gradient).

Steepest gradient in California, 132 feet per mile for 2.09 miles. Streams to bridge : Sabine, Trinity, Brazos, Colorado, and Pecos in Texas ; Rio Grande and San Pedro in New Mexico ; and Rio Colorado in California.

Points of water navigation are Sodo Lake near Shreveport, Red River ; head of the Gulf of California, and San Diego.

Time estimated for surveys, location and construction of road in Texas, 5 years.

Time estimated for surveys, location and construction of road in New Mexico, $3\frac{1}{2}$ years.

Time estimated for surveys, location and construction of road in California, 3 years.

Whole road if commenced in 1856 and carried on in three divisions at the same time may be completed in 1861.

Division of road through Texas will be self-sustaining.

Division of road through New Mexico will likewise be self-sustaining.

Division of road in California, without the eastern connexions, would not be self-sustaining.

With regard to equated distances, I would observe, that all the measurements made to determine the length of the route by the 32nd parallel of latitude, were by odometers attached to the wheel of a wagon, or estimated by time and travel with courses and compass. These distances are the surface distances, and although allowances are made, (an average of one tenth in some cases) still they will always be greater than the length of the road when graded. In the projection of the map, these measurements are made to conform to positions determined astronomically, by computing and applying a rela-

tive proportion between geographical points and the latitudes and departures obtained from courses and odometer measurements.

APPROXIMATE DISTANCES BY RAILWAY THROUGH TEXAS.

From Boston to San Diego, California, 3,196 miles.

"	New York	"	"	2,971	"
"	Norfolk	"	"	2,824	"
"	Charleston,	"	"	2,599	"
"	Cincinnati,	"	"	2,371	"
"	Chicago,	"	"	2,440	"
"	St. Louis,	"	"	2,121	"
"	Memphis,	"	"	1,923	"
"	New Orleans,	"	"	1,931	"
"	Galveston,	"	"	1,700	"
"	Matagorda Bay,	"	"	1,650	"

Add 500 miles, and it will give the whole distance to San Francisco.

The instruments used by me in this reconnaissance for obtaining the data upon which is based the results given in this report were as follows:

One six inch radius sextant, by Spencer, London, with mercurial horizon.

One four inch exploring sextant.

One pocket chronometer watch.

One Syphon Barometer, No. — by——, Paris. Two Aneroids.

One cistern barometer, No. 392, by Green, New York

One Prismatic Compass.

Exploring Compasses, Odometer, Thermometers, etc.

These instruments were all good, and gave satisfactory results. The appended *tables* will exhibit the various meteorological and barometrical determinations, as also localities fixed astronomically. The maps and profiles will show the lines examined, and those recommended for further explorations, preparatory to the surveys for

locating the road. The principal part of my astronomical observations, as well as barometrical, were reduced by D. G. Major, Esq., Computer, Washington City; and the remainder by Theo. W. Werner, Esq., Computer &c., New York. Appended to the table is the communication of Mr. Major, explanatory of the reductions.

Before closing this report, I beg to be permitted to refer to the valuable aid I received at the hands of my assistants, and men throughout the entire expedition. Messrs W. W. de Lacy and Peter Bardy, had charge of detached exploring parties at various dangerous, and difficult points, performing their duty well; and Mr. Charles Schuhard was invaluable as an artist and assistant. The numerous accurate and well executed views of Mr. Schuhard attest the talent and labor displayed by him. Indeed, but for the determination and energy of each man of my party, their superior intelligence and respect for discipline, it would have been impossible for so small a number to have encountered and accomplished what they did with so little loss.

They were all Texans, and numbered but sixteen when we left San Antonio, exclusive of Doctor C. Graham, of Harrodsburg Springs, Ky., J. G. Howard, and Judge Hyde, of El Paso, who accompanied the party to the Rio Grande, standing guard and rendering every assistance required. From El Paso, westward, the number was augmented to 26, including the Rev. J. H. Reid, chaplain of the garrison of Albuquerque, who desirous of seeing the country and wishing to visit Fort Yuma, came within the rules of the camp. Most of the time the party were separated—thirteen each—for the purpose of exploring different lines, and upon every occasion Mr. Reid acted his part generously and firmly.

We reached San Diego on the Pacific the 6th of June, five months from San Antonia, having traveled some 2,200 miles without guides, and of which was explored over 1000 miles of lines that never had instruments on before.

It was natural that we should in this distance experience privations, and it was so expected, particularly, through that unexplored region, west from the Santa Cruz valley, and in penetrating the sand hills to the head of the Gulf. But notwithstanding this, and through a hostile Indian country part of the way,—I lost not a man, nor had an animal stampeded or stolen. A number of animals broke down and were left behind, but it was after they had been necessarily worked to death.

I have endeavored to avoid the monotony of an every day journal or description, confining myself to that which I thought would tend to facilitate the understanding of the features of this country, its advantages and disadvantages for a Pacific railway. Hereafter I may chance throw into narrative shape the various incidents of several campaigns through this region, when I shall take much pleasure in recurring to the many kindnesses received by our party, and great facilities rendered the expedition, from the post of Fort Mason, Col. May; Fort Chadbourne, Lieut. Hawes; the several garrisons on the Rio Grande, and from Major Heintzelman, commanding Fort Yuma; as likewise from Messrs. James McGoffin, Capt. Ankrum, and S. Hart, Esq., of El Paso; and Capt. Garcia, of the Mexican Lancers, and Doctor Thomas Spence, Alcalde of Altar.

Major Heintzelman, whose long and well-tried services on the Colorado, enabled him to learn the sur-

rounding country, afforded me much information of the topography from his notes and sketches. In addition, his hospitality and generous assistance to the party, after the difficult examination from Tubac to the Gulf, and over the dry Jornada to the Colorado, can never be forgotten.

For valuable data, which has aided me greatly in computing my estimates for this road, I am under obligations to the kindness of W. J. McAlpine, Esq., late Surveyor and Engineer of the State of New York, and to General Orville Clarke, the ability and experience of whom are so well known. The latter gentleman proceeded to Texas and passed over several hundred miles of the ground for the purpose of observing its nature in reference to a railway, and whose report which I have made allusion to, was so favorable.

It will now be admitted, that all the elements for determining the feasibility and practical advantages of a railway through the northern part of Texas to the Pacific, have been fully considered, and proven not only in time of transit, cost of conveyance of passengers and freight, but economy of construction and use of capital, and time required for the expenditure.

In conclusion, I would remark, that it has been my desire to give the facts as they appeared to exist from close observation and study, and not to speculate upon matters which I know nothing about; all of which is respectfully submitted.

A. B. GRAY.

APPENDIX.

TABLE A.

APPROXIMATE ELEVATION OF IMPORTANT POINTS IN THE VICINITY OF
THE PROPOSED ROUTE TO THE PACIFIC, DETERMINED BAROMETRI-
CALLY.

Names of places.	Height above the Sea. FEET.	Authority.
Fort Chadbourne, Texas, in lat. 32 deg. 01 min. 40 sec. - - -	1677	A. B. Gray.
Mustang Springs lat. 32 deg. 04½ min. Eastern Edge of the Llano Estacado,	1982	"
Summit of Llano Estacado, - - -	2995	"
Rio Pecos, lat. 31 deg. 45 min. -	2497	"
East base Guadalupe Mts., Summit Pass lat. 31 deg. 50 min. - -	4897	"
Ojo del Cuervo (Crow spring) -	2669	"
Sierra de los Cornudos (Horn Moun- tain), - - - - -	4480	"
Foot of Sierra del Alamos, - -	4804	"
Summit of the Hueco Mountain Pass, -	4549	"
Rio Grande at Hart's Mill's, El Paso, -	3725	"
Ranche of Frontera, Rio Grande, -	3800	Col. J. D. Graham.
Level of Mesa opposite Frontera, -	4098	A. B. Gray.
La Playa or Dry Lake of Col. Cooke, -	4445	"
Summit of divide between the waters of the Atlantic and Pacific, 5 miles west of Ojo del Playa, - - - -	4714	"
Summit of the Pass of La Puerta, -	4658	"
Valle de Sauz Clenaga (Valley of Wil- low Swamps,) - - - -	4068	"
Chiricahua mountains, "Pass of the Dome," - - - - -	4776	"
Chiricahua mountains "Pass del Dado," -	5228	Lieut. G. W. Parke.
Valley of the Playa de los Pimas, -	4342	"
Summit of San Pedro Pass, - -	4731	A. B. Gray.
Rio San Pedro, lat. 31 deg. 39½ min. -	4246	"
Head of Babacomeri creek, - -	5097	"

Names of places.	Height above the Sea. FEET.	Authority.
Divide between Babacomeri and Sono- ita creek, - - - - -	5330	A. B. Gray.
Mouth of Sonoita or Clover creek at the Santa Cruz Valley, - -	3627	"
Santa Cruz Valley near Tubac, - -	3380	"
Neighborhood of Tucson, - -	2300	Lieut. G. W. Parke.
Pimas Villages, Gila river, - -	1364	"
Junction of Gila and Colorado, Com- puted Height of Bridge, - -	150	A. B. Gray.
Carrizo creek, - - - - -	431	Lt. R. S. Williamson.
Summit of Warner's Pass, California, -	3780	"
Summit of San Gorgonia Pass, Califor- nia, - - - - -	2808	"

At several points, my means of obtaining the elevations above the sea have not been so accurate as those of Lieut. Parke and Lieut. Williamson, and consequently I have adopted the results given by them, as above, and which are referred to in the body of this report.

APPROXIMATE GRADIENTS.

Eastern Boundary of Texas to Fort Chadbourne, 407 miles.

Average rise per mile 3 feet, maximum grade 37 feet.

Fort Chadbourne to Mustang Springs 100 miles.

Average rise per mile, from 8 to 17 feet. Maximum grade, 27.7 feet.

Mustang Springs to Pecos River 115 miles.

Average rise per mile 15.5 feet for 71 miles, to summit of Llano Estacado. Average fall per mile of 13.4 feet 44 for miles, from summit to river.

Pecos River to summit of Guadalupe Pass, foot of Peak.

Average rise per mile of 31.2 feet for 35 miles, and for 27 miles a rise 45.4 feet per mile.

Summit of Guadalupe Pass to level of Plain ojo del Cuervo.

Average descending grade, 91 feet per mile for 7 miles; and 54.7 feet per mile for 15 miles.

Ojo del Cuervo to Sierra del Cornudas.

Average ascending grade, 37.4 feet per mile for 30 miles. To Sierra del Alamo 6 miles, 35.9 feet per mile ascent.

Sierra del Alamo to Summit Pass of Hueco Mountains.

Average ascending grade, 10.4 feet per mile for $20\frac{1}{2}$ miles; the first $17\frac{1}{2}$ miles, very gently undulating, having a rise of only a few feet to the mile; when for 3 miles there is a surface ascent of 52 feet to the mile to summit.

Hueco Pass to Rio Grande, at Molino del Norte, near El Paso.

Average descending grade of 75.6 feet per mile for 4 miles; thence to edge of Mesa, near river, a descending grade of 44.5 feet per mile for 13 miles; and 8 miles over Mesa of 6 feet per mile descent; thence for 4 miles to river bank 50 feet per mile, depending on height of bridge at crossing.

From Rio Grande to Summit of Divide between the waters of the Atlantic and Pacific.

Average ascending grade, $2\frac{1}{2}$ feet per mile for 128 miles. Maximum gradient, 53.7 feet per mile for 5

miles. From summit of divide, for 5 miles west, there is a fall of 11.2 feet per mile, and for 17 miles through the Pass La Puerta to Valle de Sauz, an average descent of 34.7 feet per mile. For 36 miles, to lowest depression on plain south-west of La Puerta, is a descent of 27 feet to the mile.

Average rise to spring in Dome Mountain Pass 13 feet per mile for 32 miles.*

To summit of Dome Pass, 5 miles ascent of 63 feet per mile.

From summit of Pass to Playa de los Pimas, descending gradient of 18 feet per mile for 27 miles.

For six miles in San Pedro Pass, grade of 54 feet per mile.

To summit of San Pedro Pass, 15 feet per mile ascent $4\frac{1}{2}$ miles.

From summit to San Pedro, $11\frac{1}{2}$ miles, at 13 feet per mile descent.

From Rio San Pedro, to Santa Cruz Valley, at Tubac.

Average ascending grade to Babacomera Rancho, 25 feet per mile for $15\frac{1}{4}$ miles.

To Wild Peas Springs, ascending grade for 10 miles of 48 feet per mile.

To summit between Babacomera and Sonoita Creeks $5\frac{1}{2}$ miles at 43 feet per mile.

From summit to Sonoita Springs, $4\frac{1}{2}$ miles, descending grade of 86 feet per mile; thence for $15\frac{1}{2}$ miles at 61 feet per mile; thence $10\frac{1}{2}$ miles descending grade, at 38 feet per mile.

*From the Valle de Sauz through the *del Dado Pass*, there will be a maximum grade of 194 feet per mile for $2\frac{1}{4}$ miles. This is a surface grade ascertained by barometer, by Lieut. Parke, and will be greatly reduced in constructing a railway.

From mouth of Sonoita Creek to the town of Tubac, average descending grade, 26 feet per mile for $12\frac{1}{2}$ miles.

From the Valley of Santa Cruz to the Junction of the Gila and Colorado rivers.

Average descending grade, 26 feet per mile for 43 miles to Tucson.

From Tucson to Rio Gila, near Pimas Villages, 90 miles average descending grade of 20 feet per mile.

To Junction, 190 miles, average grade of 6.9 feet per mile, down Valley of the Gila; and maximum grade not exceeding 50 feet per mile, over a spur of the Sierra de los Estrellas.

Average grade from Fort Yuma, at Colorado River, to Foot of San Gorgonia Pass, $2\frac{1}{2}$ to 10 feet (alternating) for 120 miles.

To summit 53 miles, average ascending grade of 5 feet per mile for 53 miles, with maximum grade of 132 feet for 2.09 miles.

THE TEXAS WESTERN RAILROAD CHARTER.

AN ACT

Passed February 16th, 1852.

SECTION 1. *Be it enacted, by the Legislature of the State of Texas,* That Rufus Doane, Lucius C. Clopton, James C. Hill, William T. Scott, Willis Stewart, Sam. Bogart, E. E. Lott, L. B. Camp, James W. Throckmorton, J. D. Todd, their associates and successors, be and are hereby created and established a body corporate and politic, under the name and title of the **TEXAS WESTERN RAILROAD COMPANY**, with the capacity, in said corporate name, to make contracts, to have succession and a common seal; to make by-laws for its government and the regulation of its affairs; to sue and be sued; to plead and be impleaded; to grant and receive, and generally to do and perform all such acts and things as may be necessary or proper for or incident to the fulfillment of its obligations, or the maintenance of its rights, under this act, and consistent with the Constitution of the State.

SEC. 2. Said company is hereby invested with the right to locate, construct, own, and maintain a railroad, commencing at a suitable point on the eastern boundary line, and thence running, by such course as said company shall decree and determine to be most suitable, to El Paso, on the Rio Grande River, with the right of making, owning and maintaining such branches of said railway as they may deem expedient.

SEC. 3. The parties named in this act are hereby appointed commissioners, and invested with the right of forming and organizing said company, and generally of exercising the powers of directors, until directors are chosen or appointed by such persons as may subscribe to the stock of said company, when the powers of said commissioners shall cease.

SEC. 4. The capital stock of said company—to consist of all its property, real and personal, franchises and rights to property,—shall be divided into shares of \$100 each, each share entitling the owner thereof to one vote, by himself or proxy, at all meetings of said company: said shares shall be deemed personal estate,

and shall be transferable by any conveyance in writing, recorded by the Treasurer in books kept by him at his office, or in such manner as the By-laws of said company shall provide.

SEC. 5. The immediate government and direction of the affairs of said company shall be vested in a board of not less than six directors, who shall elect one of their own number as President of said company; no person shall be eligible to the office of director, unless an owner or subscriber of at least five shares of the stock of said company. The directors shall have power to fill any vacancy that may occur in said board from non-election, death, or otherwise, and may appoint a Secretary, Treasurer, and such other officers and agents as they may consider necessary, and prescribe and require bonds for the faithful performance of their duties; they may, if not otherwise provided for by the By-laws, determine the manner of conducting all meetings, the number of members that shall constitute a quorum to do business, and to do, or cause to be done, all other lawful matters and things which they may deem necessary and proper in conducting the affairs of the company; they shall keep, or cause to be kept, accurate records of all meetings of the directors and company, and accurate books of accounts of the receipts and expenditures of the company, and all other books necessary and proper to be kept by such company, which shall be open to the inspection of the stockholders. A majority of the board of directors shall have the authority of a full board; and all conveyances and contracts, in writing, executed by the President and countersigned by the Secretary, or any other officer or person authorized by the directors, under the seal of the company, and in pursuance of a vote of said directors, shall be valid and binding.

SEC. 6. The shares may be disposed of, and books opened for subscriptions thereto, in such manner and on such terms as said commissioners shall determine will be for the best interests of said company; and any agreement in writing, by which any person shall become a subscriber to the capital stock of said company, may be enforced against him according to its terms; and if any subscriber shall fail to pay any amount due upon shares subscribed by him, according to the terms of his subscription, the directors may sell at auction and transfer to the purchaser the shares of such delinquent; and if the proceeds of sale shall not be sufficient to pay the amount due on said subscription, with interest and

charges, such delinquent shall be held liable to the company for the deficiency; and if the proceeds shall exceed the amount so due, with interest and charges, said delinquent shall be entitled to the surplus.

SEC. 7. It shall be lawful for the company to enter upon and purchase, or otherwise take and hold, any land necessary for the purpose of establishing and constructing said railway, with all necessary depots and other buildings; and if they shall not be able to obtain said lands by agreement with the owner thereof, they shall pay therefor such compensation as shall be determined in the manner provided by the following section; *provided*, that the lands so taken for the road-bed shall not exceed two hundred feet in width; and for depots and other buildings, only such further width as shall be needed for such purposes.

SEC. 8. Any person, when land has been taken, as aforesaid, without agreement or satisfactory compensation, may apply to the District Court of the county in which said land is situated, for the appointment of, and said court shall thereupon appoint, three disinterested freeholders of the county, who shall appoint a time and place to hear the applicant and the company; to whom shall be given, by said freeholders, reasonable notice of said time and place; and said freeholders shall, after being sworn, and after due hearing of the parties, determine the amount of compensation, if any, to which the applicant may be entitled, and make return of their award to the next succeeding term of said court; and said award, if not rejected by said court for sufficient cause then shown, shall be entered up as a judgment of said court. In determining the question of compensation, said freeholders shall be governed by the actual value of the land at the time it was taken, taking into consideration the benefit or injury done to other lands and property of the owner, by the establishment of said railway; and if the amount of compensation awarded by said freeholders shall not exceed the amount offered by said company to the owner, prior to said application to the court, the applicant shall pay the costs of the proceedings; otherwise the company shall pay the same.

SEC. 9. It shall be the duty of the company, whenever any State or county road, now by law established, shall be crossed by the track of said railway, to make and keep in repair good and sufficient causeways at such crossings; and in all cases where any

person shall own lands on both sides of said railway, and there shall be no other convenient access from one part to the other, such owner shall have the right of passage, free of costs, at all reasonable times, across the track of said railway.

SEC. 10. This company is hereby required, at all reasonable compensation, to draw over the road the passengers, merchandise and cars of any other railroad corporation, which has been or may hereafter be authorized by the Legislature to enter with their railroad and connect with the railroad of this company; and if the respective companies shall be unable to agree upon the compensation aforesaid, it shall be the duty of the President of each company to select each one man as a commissioner; and the two commissioners, so selected, shall choose a third, in case of disagreement, neither of whom shall be a stockholder in either road, or interested therein, and they shall fix the rates, which shall not be changed for one year from the time of going into effect. The said commissioners shall also fix the stated periods at which said cars shall be drawn as aforesaid, having reference to the convenience and interests of said corporations and public who shall be accommodated thereby. The right and power is specially conferred on said company to connect and contract with any railroad transport; and in case of disagreement between said companies, the same shall be referred and settled as aforesaid, and be binding for one year as aforesaid.

SEC. 11. Said company may acquire real estate by gift or purchase, and that such commissioners herein-before mentioned, shall have full authority to solicit and receive subscriptions and conveyances of land to said company until the time fixed for the first meeting of said commissioners, which authority may then be extended by said meeting; which said land so obtained shall be alienated by said company in the following manner: one-fourth in six years, the one-fourth in eight years, the one-fourth in ten years, and the one-fourth in twelve years, from the time the same was acquired.

SEC. 12. If the track of this railway shall cross any navigable stream, it shall do it in such a way as not to obstruct its navigation.

SEC. 13. Said company shall have the right to demand and receive such rates and prices for the transportation of passengers and freight as they may think proper to establish, not to exceed

five cents per mile for passengers, and fifty cents per hundred pounds for freight for every hundred miles the same may be carried.

SEC. 14. If any person shall wilfully injure or obstruct said railway or its property, such person may be punished, when prosecuted by indictment for said offence, in due course of law, and also liable to action by said company, or any person whatever, who may suffer in person or property from said wilful obstructions for the amount of damages occasioned thereby.

SEC. 15. There shall be granted to said company eight sections of land, of six hundred and forty acres each, for every mile of railway actually completed by them and ready for use: and upon the application of the President of the company, or any duly authorized agent thereof, stating that any section of five miles or more of said railway has been completed and is ready for use, it shall be the duty of the Comptroller of public accounts to require the State engineer, or a commissioner to be appointed by the Governor, to examine said railway; and upon his certificate that said section of said railway has been completed in a good and substantial manner, and is ready for use, the Comptroller shall give information of that fact to the commissioner of the General Land Office, whose duty it shall be to issue to said company land certificates to the amount of eight sections of land, of six hundred and forty acres each, for each and every mile of railway thus completed and ready for use: such certificates shall be for six hundred and forty acres each, and shall be located upon any unappropriated public domain of the State of Texas, within twelve months from the issuing thereof, which date shall appear upon the face of each certificate; and upon the return of the field notes of any survey made by virtue of any certificate thus issued, it shall be the duty of the commissioner of the General Land Office to issue patents to said company in their corporate name—one-fourth of which said lands thus patented shall be alienated by the company in six years, one-fourth in ten years, and the other fourth in twelve years; so that the whole of the lands thus granted shall pass from the hands of the company within twelve years of the date of the patents thus issued.

SEC. 16. Said company shall be required to have a good and sufficient brake upon the hindmost car in all trains transporting passengers or merchandise, and also, permanently stationed there

a trusty and skillful brakeman, under a penalty not exceeding the sum of one hundred dollars for each offence, to be recovered in any court of competent jurisdiction, for the benefit of the State; and said company shall cause to be placed on each locomotive engine passing on their road, a bell of the weight of at least thirty-five pounds, or a steam whistle, and the said bell shall be rung, or the whistle blown, at the distance of at least eighty rods from the place of crossing any highway or turnpike, and kept ringing or blowing until the engine has passed or stopped; said company shall be required to construct their railroad with good T or U iron rails; *provided*, that no land shall be donated unless the company shall actually commence their road within four years, and actually complete and finish at least ten miles within ten years.

SEC. 17. The first meeting of the commissioners or directors appointed by this act, shall be held at Marshall, in Harrison county, on the first Monday in July next, in which and all subsequent meetings, which may be held at such times and places as the directors may think best, said directors may act in person or by proxy.

SEC. 18. Nothing in this act shall be so construed as to confer banking privileges or powers, of any kind whatever.

SEC. 19. That if said railway shall not be commenced within five years from the passage of this act, and at least twenty miles thereof are not completed within six years, then this charter shall be null and void; and it is hereby provided and declared, that it shall be lawful for any other railway hereafter to be constructed to cross the said railway, or any branch thereof, or to connect at any point therewith.

SEC. 20. The said company shall have the right to take and hold so much of the public land, not exceeding two hundred feet wide, as the said railway or any of its branches may pass through for the track thereof, and such additional width as may be absolutely necessary for any depot or other work for the purpose of said railroad, that the company may deem proper to establish and in all cases when such railroad, or any branch thereof, shall pass through any public lands, all such lands, to the depth of three miles from the extension line of the track on each side thereof, shall be reserved for the State, from and after the time such track shall be fixed or designated by survey, recognition, or otherwise

and the said lands, as the road is constructed, shall be divided into sections fronting one mile each on the road, plainly marked; and of these reserved lands the company shall have the right by virtue of any of the certificates issued in accordance with the provisions of this act, to cause to be located, surveyed, and patented for their use, each alternate section, such section in each instance embracing a tract of land fronting one mile, pursuing an equal width; and the remaining sections shall continue the property of the State until disposed of by the Legislature.

Approved, February 16th, 1852.

AN ACT

To encourage the Construction of Railroads in Texas, by donation of lands, passed January 30th, 1854.

SECTION 1. *Be it enacted, by the Legislature of the State of Texas,* That any railroad company chartered by the Legislature of this State, heretofore and hereafter, constructing within the limits of Texas a section of twenty-five miles or more of railroad, shall be entitled to receive from the State a grant of sixteen sections of land for every mile of road so constructed and put in running order.

ERRATA.

Page 81, five lines from top, read "waters of the Gulf (1078 miles)" in place of "waters of the (2078 miles)."

Page 86, five lines from top, instead of 2,837,500, read 3,550,000.

Page 83, twenty lines from top, read 128 ounces, instead of 123.

Page 99, ten lines from top, read 9 miles instead of 6 miles.

Page 68, eight lines from top, read "2.09" miles instead of "209" miles.

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